University of Alberta

Moving Actively into Primary Care Prevention

by

Joanne Gail Gesell ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of

the requirements for the degree of Master of Arts

Faculty of Physical Education and Recreation

Edmonton, Alberta

Spring 2002

National Library
of Canada

Acquisitions and
Bibliographic Services

395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque nationale
du Canada

Acquisitions et
services bibliographiques

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence

Our file Notre référence

The author has granted a non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of this thesis in microform, paper or electronic formats.

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de cette thèse sous la forme de microfiche/film, de reproduction sur papier ou sur format électronique.

The author retains ownership of the copyright in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

L'auteur conserve la propriété du droit d'auteur qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

0-612-69643-X

Canada

University of Alberta

Library Release Form

Name of Author: Joanne G. Gesell

Title of Thesis: Moving Actively into Primary Care Prevention

Degree: Master of Arts

Year this Degree Granted: 2002

Permission is hereby granted to the University of Alberta Library to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly or scientific research purposes only.

The author reserves all other publication and other rights in association with the copyright in the thesis, and except as herein before provided, neither the thesis nor any substantial portion thereof may be printed or otherwise reproduced in any material form whatever without the author's prior written permission.

Joanne Gesell

Joanne G. Gesell
8118 189A Street NW
Edmonton, AB
T5T 5C5

Submitted to the Faculty of Graduate Studies and Research

University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Moving Actively into Primary Care Prevention submitted by Joanne Gail Gesell in partial fulfillment of the requirements for the degree of Master of Arts.

W Rodgers
Dr. Wendy Rodgers, Supervisor

Gordon J Bell
Dr. Gordon Bell, Committee Member

Dr. Jeff Johnson, Committee Member

R Plotnikoff
Dr. Ron Plotnikoff, Committee Member

Dec 20, 2001

It is not the years in your life, but the life in your years that counts.

Adlai Stevenson

Abstract

This study was a three-month randomized control trial comparing two different methods of promoting physical activity in medical clinics. Sedentary adults aged 40-70 years were recruited from four different medical clinics by their family physician. Analyses of variance (ANOVAs) found significant main effects within-subjects for time for physical activity ($F = 11.13$, $p < .01$), general health ($F = 12.17$, $p < .01$), role limitation (emotional) ($F = 11.53$, $p < .01$), mental health ($F = 12.22$, $p < .01$), and the mental component summary ($F = 13.58$, $p < .01$), pre-exercise heart rate (hr) ($F = 10.64$, $p < .01$), exercise hr stage 4 ($F = 12.45$, $p < .01$), exercise hr stage 5 ($F = 22.16$, $p < .01$), and exercise hr stage 6 ($F = 25.00$, $p < .01$). Further investigation is required to continue the research in this area of physical activity promotion.

Acknowledgment

This thesis research would not have been possible without the guidance, collaboration and support of the following individuals: my advisor, Wendy Rodgers, thank you for encouraging me to venture from the exercise psychology lab as a "baby researcher" and to pursue my research independently; my thesis committee, Gord Bell, Jeff Johnson and Ron Plotnikoff, thank you for the physiological, statistical, and theoretical expertise you provided to this project; a special thank you Gord, for providing the means for 100 fitness assessments; physicians and staff of the medical clinics, thank you for your cooperative efforts to recruit participants to the study; participants in the study, thank you for making a commitment to become more physically active during the middle of an Edmonton winter; Alex Game, thank you for cheerfully accommodating participant's schedules and efficiently arranging the testing in the Sport Performance Unit; Ann McLeod, thank you for providing your editorial expertise and for enduring my incessant discussions of correlations, regressions and time 1/time 2 changes; Phil Wilson, thank you for your patience and assistance with the statistical portion of my study; Shawn Fraser and Terra Murray, thank you for making me laugh.

Table of Contents

Chapter 1

Introduction 1
  Purpose of this study 6
  Rationale 6
  Theoretical Basis 12
    Operationalization and Measurement 17

Chapter 2

Review of Literature 22
  Physical Activity 22
    Benefits 22
    Recommendations 24
    Prevalence 25
  Health-Care Utilization and Older Adults 25
    Senior Population 25
    Demographic Shift 26
    Preventive Medicine 26
  Primary-Care Intervention 27
    Recommendations 27
    Physician Counseling 28
      Critical Commentary 41
      Methodological Issues 42
      Intervention Efficacy 43
      Future Research 44
      Practice Recommendations 45
      Summary 45

Chapter 3

Methods and Procedure 47
  Study Procedure 47
  Participant Selection 49
  Physical Activity Consultant 50
  Clinical Settings 50
  Treatment Groups 50
    Intervention 50
    Control (usual care) 52
  Measures 52
    Physiological Measures 52
    Self-Reported Measures 56
  Primary Research Objectives.. 61

Analytical Approach 61
Secondary Research Objectives 62
Analytical Approach 62
Ethical Considerations 62

Chapter 4

Results 64
Sample Characteristics 64
Descriptive Statistics 64
Primary Research Objectives 68
Differences at Time 1 68
Changes from Time 1 to Time 2 70
Secondary Research Objectives 72
Predicted Changes in Self-Reported Physical Activity 72
Theory of Planned Behavior 72
Self-Efficacy 78
Social Provisions Scale 81
Predicted Changes in Health-Related Quality of Life 83
Self-Efficacy 83
Social Provisions Scale 87
Predicted Changes in Physical Fitness (heart rate) 90
Theory of Planned Behavior 90
Self-Efficacy 94
Social Provisions Scale 98

Chapter 5

Discussion 101
Primary Research Objectives 101
Differences at Time 1 101
Referral Clinic 101
Sex 102
Treatment Condition 102
Changes from Time 1 to Time 2 102
Physical Activity 103
Health-Related Quality of Life 105
Physical Fitness (heart rate) 106
Secondary Research Objectives 107
Influence of Theoretical Variables on Self-Reported Physical Activity 107
Theory of Planned Behavior 107
Self-Efficacy 109
Social Provisions Scale 111
Influence of Theoretical Variables on Changes in Health-Related Quality of Life 112

Self-Efficacy 112
Social Provisions Scale 113
Influence of Theoretical Variables on Changes in Physical Fitness (heart rate).. 114
Theory of Planned Behavior 114
Self-Efficacy 116
Social Provisions Scale 117
Summary of Key Findings 117
Primary Research Objectives 117
Secondary Research Objectives 117
Limitations 121
Recommendations and Future Directions 122
Methods 122
Practice 124
Theory 126
Conclusions 127

References.. 130

Bibliography... 145

Appendices

Appendix A: Research Design 146
Appendix B: Physician Advice Cue Chart 147
Appendix C: Participant Information Letter 148
Appendix D: Inclusion/Exclusion Criteria 151
Appendix E: Physician Agreement to Participate 152
Appendix F: Physical Activity Readiness Questionnaire 153
Appendix G: Intervention Tools/Worksheets 154
Appendix H: Godin Leisure Time Exercise Questionnaire 165
Appendix I: Theory of Planned Behavior Questionnaire.......... 166
Appendix J: MOS 36-Item Short-Form Health Survey.............170
Appendix K: Social Provisions Scale Questionnaire 176
Appendix L: Consent Form 180
Appendix M: Theory of Planned Behavior Chart 181
Appendix N: Primary Intervention Study Chart 186
Appendix O: ANOVA at Baseline on all Variables................... 196

Tables

Table 1 Descriptive statistics of Theory of Planned Behavior measures

Table 2 Descriptive statistics of Health-Related Quality of Life measures

Table 3 Descriptive statistics of Social Provisions Scale measures

Table 4 Descriptive statistics of physiological measures

Table 5 Significant effects at time 1 among referral clinics

Table 6 Significant effects at time 1 between females and males

Table 7 Tests of within-subject contrasts over time

Table 8 Bivariate correlations from time 1 Theory of Planned Behavior sub-scale scores and time 1 physical activity

Table 9 Regression analysis examining the influence of time 1Theory of Planned Behavior sub-scales on time 1 physical activity intention

Table 10 Regression analysis examining the influence of time 1Theory of Planned Behavior sub-scales including current physical activity on time 1 physical activity intention

Table 11 Bivariate correlations from time 1 Theory of Planned Behavior sub-scale scores and time 2 current physical activity

Table 12 Regression analysis examining the influence of time 1 Theory of Planned Behavior sub-scales including physical activity intention on time 2 current physical activity

Table 13 Bivariate correlations from time 2 Theory of Planned Behavior sub-scale scores and time 2 current physical activity

Table 14 Regression analysis examining the influence of time 2 Theory of Planned Behavior sub-scales including time 2 current physical activity on time 2 physical activity intention

Table 15 Bivariate correlations from time 1 Self-Efficacy sub-scale scores and time 1 physical activity intention

Table 16 Regression analysis examining the influence of time 1 Self-Efficacy sub-scales on time 1 physical activity intention

Table 17 Bivariate correlations from time 1 Self-Efficacy sub-scale scores and time 2 current physical activity

Table 18 Bivariate correlations from time 2 Self-Efficacy sub-scale scores and time 2 physical activity intention

Table 19 Regression analysis examining the influence of time 2 Self-Efficacy sub-scales on time 2 physical activity intention

Table 20 Bivariate correlations from time 1 Social Provisions sub-scale scores and time 1 physical activity intention

Table 21 Bivariate correlations from time 1 Social Provisions sub-scale scores and time 2 current physical activity

Table 22 Bivariate correlations from time 2 Social Provisions sub-scale scores and time 2 physical activity intention

Table 23 Bivariate correlations from time 1 Self-Efficacy scores and time 2 health-related quality of life

Table 24 Regression analysis examining the influence of time 1 Self-Efficacy sub-scales on the time 2 general health sub-scale of the SF-36

Table 25 Regression analysis examining the influence of time 1 Self-Efficacy sub-scales on the time 2 role limitation (emotional) sub-scale of the SF-36

Table 26 Regression analysis examining the influence of time 1 Self-Efficacy sub-scales on the time 2 mental health sub-scale of the SF-36

Table 27 Regression analysis examining the influence of time 1 Self-Efficacy sub-scales on the time 2 mental component summary sub-scale of the SF-36

Table 28 Bivariate correlations from time 1 Self-Efficacy scores and change in health-related quality of life

Table 29 Bivariate correlations from time 1 Social Provisions Scale scores and time 2 health-related quality of life

Table 30 Bivariate correlations from time 1 Social Provisions Scale scores and change in health-related quality of life

Table 31 Bivariate correlations from time 1 Theory of Planned Behavior scores and time 2 fitness measures (heart rate)

Table 32 Regression analysis examining the influence of time 1 Theory of Planned Behavior on pre-exercise heart rate

Table 33 Bivariate correlations from time 1 Theory of Planned Behavior scores and change in fitness measures (heart rate)

Table 34 Regression analysis examining the influence of time 1 Theory of Planned Behavior on change in pre-exercise heart rate

Table 35 Bivariate correlations from time 1 Self-Efficacy scores and time 2 fitness measures (heart rate)

Table 36 Bivariate correlations from time 1 Self-Efficacy scores and change in fitness measures (heart rate)

Table 37 Regression analysis examining the influence of time 1 Self-Efficacy on change in heart rate at stage 5 of the treadmill test

Table 38 Regression analysis examining the influence of time 1 Self-Efficacy on change in heart rate at stage 6 of the treadmill test

Table 39 Bivariate correlations from time 1 Social Provisions sub-scale scores and time 2 fitness measures (heart rate)

Table 40 Bivariate correlations from time 1 Social Provisions sub-scale scores and change in fitness measures (heart rate)

Figures

Figure 1 Theory of Planned Behavior Chart

INTRODUCTION

The health risks of a sedentary lifestyle and the apparent health benefits of physical activity in the prevention of coronary heart disease, hypertension, non-insulin dependent diabetes mellitus, depression, osteoporosis, and some cancers have been well documented (Blair, Applegate, Dunn, Ettinger, Haskell, King, et al., 1998). Modern conveniences have eliminated much of the necessity of physical activity formerly required for survival. National surveys claim that there are fewer occupations that require daily physical activity, and that there is an increased dependence on motorized transportation and other labour-saving devices (Biddle and Fox, 1998). In addition, the convenience of engaging entertainment furnished by television, videos and computers has significantly increased in recent years (Biddle and Fox, 1998). As a result, many people have grown accustomed to a sedentary lifestyle.

Public health officials have recognized the significance of physical activity and have adopted a new health message that suggests that adults should accumulate a minimum of 30 minutes of moderate-intensity physical activity on most days of the week (Calfas, Long, Sallis, Wooten, Pratt, and Patrick, 1996). Despite the known importance of physical activity and the promotion of active lifestyles by various government agencies and non-government organizations, most of the adult population remain sedentary (Biddle and Fox, 1998; Marcus, Goldstein, Jette, Simkin-Silverman, Pinto, Milan, et al., 1997; Wiest and Lyle, 1997). Current epidemiological data indicate that only 21% of Canadians are classified as active (3.0 or more kilocalories per kilogram of body weight per day) during leisure time (Statistics Canada, 1998). However, approximately 56% of the Canadian population is considered inactive because their leisure-time physical activity accounts for less than 1.5 kilocalories per kilogram of body weight per day (Health Canada, Statistics Canada and Canadian Institute for Health Information, 1999).

People need to be physically active to optimize their health. People of all ages should maintain their daily physical activity to a level appropriate to their capacities, needs and interest in an attempt to promote health and prevent disease (Fletcher, Blair, Blumenthal, Caspersen, Chailman, Epstein, et al., 1992). However, the health benefits of physical activity cannot be stored. In order to be protective against coronary heart disease, adherence to physically active behavior must occur regularly over the long-term (Hillsdon, 1998). Regrettably, of those individuals who start a regular exercise program, approximately 50% will have trouble maintaining the activity, and will discontinue within three to six months (Dishman, 1988). Health professionals now realize the difficulty people experience adopting and maintaining a physical activity program (Oman and King, 1998). Older people, women, the less educated, and those who are overweight are the people most at risk for inactivity (King, 1994; Pate, Pratt, Blair, et al., 1995; Sallis and Melbourne, 1990). Unfortunately, relatively few interventions have been tailored to the specific preferences or needs of these population segments (King, 1994).

Increasing scientific literature indicates that physicians can have an impact on their patients' ability to modify their health behavior (Kreuter, Scharff, Brennan, and Lukwago, 1997; Lewis and Lynch, 1993; Pinto, Goldstein and Marcus, 1998; Rosen, Logsdon and Demak, 1984). The large number of primary care physicians and the frequency with which patients visit them suggests a tremendous opportunity to provide preventive services in a day-to-day practice (Pate, et al., 1995; Reed, Jensen, and Gorenflo, 1991). Pinto, Goldstein, and Marcus (1998) have reported that seventy percent

(70%) of adults visit their physician at least once each year. General practitioners, therefore, have access to a large proportion of the sedentary population (Swinburn, Walter, Arroll, Tilyar, and Russell, 1998). Physicians are in a position to encourage sedentary patients to become more physically active and emphasize the risks associated with inactivity (Fletcher, et al., 1992).

In Western culture, clients view their physicians as credible sources of health information (Kreuter et. al., 1997). In general, clients are concerned about how their lifestyle impacts on their health and most would welcome relevant counseling from their physician (Graham-Clarke and Oldenburg, 1994; Lewis and Lynch, 1993; Marcus et al., 1997; Rosen et. al., 1984; Simons-Morton, Calfas, Oldenburg, and Burton, 1998). Physicians are in an unparalleled position to reduce health risks because of this unique relationship with individual patients (Logsdon, Lazaro, and Meier, 1989). If even a relatively small percentage of patients respond to physician encouragement, a large absolute number of patients may modify their physical activity patterns, with subsequent improved health status and well-being (Pate et al., 1995; Reed et al., 1991). The concept that doctors can, by their personal relationship with their clients motivate them to modify their sedentary lifestyles offers an intriguing approach to physical activity health promotion and substantial health impact (Marcus, et al., 1997; Rosen et al., 1984).

The medical office has precedence for establishing physical activity interventions. Despite the significance of regular physical activity as a preventive health course of action, many physicians do not routinely discuss it with their patients (Dishman and Buckworth, 1996; Kreuter et al., 1997; Reed et al., 1991). Even though the majority of physicians promote the benefits of regular physical activity, only about half report that they emphasize it to all of their patients (Lewis and Lynch, 1993; Reed et al., 1991). Relatively few studies have been aimed at specific patient populations to guide medical clinic interventions. These studies suggest that there are barriers to physician collaboration (Dishman and Buckworth, 1996; Lewis and Lynch, 1993; Pate et al., 1995; Reed et al., 1991). The low rates of physician counseling for physical activity have been linked to several barriers, such as time limitations (Reed et al., 1991), lack of confidence in their counseling skills (Dishman and Buckworth, 1996; Lewis and Lynch, 1993; Pate et al., 1995; Reed et al., 1991), perceived lack of patient motivation (Lewis and Lynch, 1993; Reed et al., 1991) lack of organizational support (Hillsdon, 1998; Pate et al., 1995; Reed et al., 1991), and restricted accessibility to materials to assist both the client and the physician (Hillsdon, 1998; Pinto et al., 1998). Hillsdon (1998) claimed that the greatest hindrance to primary care interventions was the wherewithal to recruit the patients who have potentially the most to gain from increased physical activity. Kreuter et al., (1997) advised that to rely on overburdened physicians to routinely perform preventive counseling without the benefit of some supportive structure is neither realistic nor practical. Therefore, a physical activity intervention that does not depend entirely on the physician might be more easily implemented in a medical clinic.

Health organizations must communicate to our sedentary society the amounts and types of physical activity that are needed to prevent disease and promote health (Pate et al., 1995). Dishman and Buckworth (1996) appealed to researchers to more fully exploit the physician-patient encounter to increase the level of physical activity. Patients are concerned about their health and may be more receptive and responsive to information when they visit their doctor (Swinburn, et al., 1998). Patient satisfaction with medical care increased as a result of the physician's attention to physical activity (Lewis and Lynch, 1993; Pinto et al., 1998; Swinburn, et al., 1998).

Physical activity and exercise have played an important role in the history of medicine and therapeutic health care. Rates of behavioral counseling by physicians appear to be increasing in recent years, but apparently only at the therapeutic level (Kreuter, et al., 1997), as opposed to general preventive physical activity. For example, physical activity is often prescribed in the treatment of coronary heart disease, hypertension, non-insulin dependent diabetes mellitus, depression, osteoporosis and obesity (Blair, et al., 1998). The training and practice of physicians have been oriented toward the treatment of sick patients which has led to a general skepticism about the practice of preventive medical services (Logsdon et al., 1989).

Physicians should assess each patient's physical activity pattern so that opportunities for primary prevention among patients in the greater population will not be missed. With the support of other health professionals, it would be possible to prescribe and counsel individual patients about physical activity. Thompson, Taplin, McAfee, Mandelson, and Smith (1995) concluded that successfully implemented preventive health-care programs shared common characteristics: the efficient detection of clients requiring preventive services and the advice to clients that preventive action is desirable. Thus, office-based counseling on physical activity has the potential to be an important preventive strategy if performed effectively. The optimal intervention to be delivered to patients at an individual level in the clinical setting is presently unknown. The role of physicians in health behavior counseling may be more suitably one of guidance, support, and referral to health care professionals specifically trained in physical activity (Blair et al., 1998). Many physicians have limited time to add preventive services to their schedules and may delegate the task to other members of the health care team, such as physical therapists and exercise scientists (Fletcher, et al., 1992).

Purpose of this study

The primary research objectives of this study were to determine if an office-based intervention would increase self-reported physical activity, health-related quality of life, and physical fitness levels of sedentary adults when implemented by a physical activity consultant in concert with the clinic physicians. The secondary research objectives of this study were to determine if the changes in self-reported physical activity, health-related quality of life, and physical fitness could be explained by theoretical constructs.

Rationale

The rising cost of health care is a major public policy issue. As it is currently structured, the Canadian health care system will not be able to support excellent care at an affordable cost in the future. Our health care system firmly supports episodic and acute care, but it is unreasonable to expect continued assistance in the decades to come (Hoffman, Rice and Sung, 1996). By the second decade of the new century, a larger proportion of the population will be seniors. People in their seventies and eighties place increased demands on the health care system. For example, in these age groups, the number of visits to the physician more than doubles compared to lifetime average use (Hoffman, et al., 1996). In addition, the number of hospitalizations also increases during our senior years. Research findings suggest a protective effect of regular physical activity against all-cause mortality in all age groups studied, and therefore an increased life expectancy (Paffenbarger, Hyde, Wing, and Hsieh, 1986; Pate et al., 1995).

Physical activity interventions that target middle-aged adults (40 to 70 years old) to increase their activity levels to acquire and maintain their health will be an investment for the future. A physical activity intervention designed for 40 to 70 year old adults would be significant for a number of reasons. The manifestation of the major chronic diseases increases during these years. A mid-life increase in physical activity is indeed associated with a decreased risk of mortality (Pate et al., 1995). These adults have been understudied with respect to physical activity and quality of life issues compared to the over 65 year old age group (Stewart, King & Haskell, 1993). The benefits of a physically active lifestyle can be experienced and enjoyed for a greater number of years (Calfas, Sallis, Oldenburg, and Ffrench, 1997). If sedentary adults would adopt a more active lifestyle, there would be tremendous improvement to the public's health and to individual well-being (Goldstein, Pinto, Lynn, Jette, Rakowski, McDermott, et al., 1999). By taking preventive action now, the number of seniors requiring extensive medical care in the future could be reduced.

The framework for preventing disability in the elderly is analogous to that of preventing disease. Buchner and Wagner (1992) claim that the risk factors predictive of future disability should be identified. Once identified, the risk factors can be modified to reduce subsequent risk (primary prevention), or signal early stages of disablement in which intervention can impede progression (secondary prevention) (Buchner and Wagner, 1992). The most thoroughly studied way to prevent gradual physiologic loss and disability in later years is the adoption of a physically active lifestyle. More active adults demonstrate less degeneration in strength, bone mass, and cognitive function (Buchner and Wagner, 1992; Pate et al., 1995). Research has indicated that adopting an active lifestyle does play an important role in maintaining one's mobility and physical independence (O'Brien Cousins and Vertinsky, 1991). For example, people who maintain or improve their strength and flexibility may be less likely to develop back pain, may be better able to carry out daily activities, and may be better able to avoid disability, particularly as they advance into older age (Pate et al., 1995). Poor physical functioning is a significant factor leading to an increased health care utilization (Stewart et al., 1993). The loss of capacity in the neurological, musculoskeletal, and energy metabolism systems is known to accelerate through disuse and inactivity (Buchner and Wagner, 1992). Therefore, increased physical activity participation could in turn help to ease the strain on the already stretched health care budgets. Furthermore, research suggests that physical activity participation may have important quality of life benefits in terms of self-rated physical health in older populations (Stewart et al., 1993). Sedentary individuals are expected to benefit the most from increasing their activity to the recommended level (Pate et al., 1995). Even small changes in daily physical activity will enable individuals to reduce their risk of chronic disease and may contribute to enhanced quality of life.

In addition to the physical benefits, a variety of psychological benefits have also been attributed to regular physical activity. For example, in a controlled trial of healthy middle-aged adults, King, Taylor, Haskell and DeBusk (1989) reported a) augmented mental performance and concentration; b) enhanced self-image and feelings of confidence and well-being; c) perceived improvement in quality of sleep, energy level, mood, tension and stress levels; and d) reduced anxiety, depression, and hostility.

A trained physical activity consultant working within a medical clinic, or office-based setting as part of the health care team could bring about possible benefits for several reasons. Physicians have the opportunity to identify sedentary adults before they require therapeutic medical care. Once identified, clients could be referred to the physical activity consultant for a personal interview. The physician would not be burdened with extra work and could feel comfortable knowing that a certified professional would be available to prescribe physical activity and related behavioral counseling to sedentary clients. The clients referred to the physical activity consultant would not have to travel to another site to receive the intervention.

Successfully propelling our sedentary society into an active one will necessitate effective promotion and acceptance of the premise that moderate physical activity affords health benefits (Pate et al., 1995). In an attempt to foster a more physically active society, the Centers for Disease Control and Prevention (CDCP) and the American College of Sports Medicine (ACSM) have encouraged physicians and other health professionals to routinely counsel patients to adopt and maintain regular physical activity (Pate et al., 1995). In spite of national health policy that physical activity be increased, there is no indication that physical activity patterns have changed during the past ten years (Dishman & Buckworth, 1996; King, Haskell, Young, Oka & Stefanik, 1995). Years of sedentary behavior, leading to low levels of physical fitness, is an important antecedent of functional limitations and loss of independence in older individuals (Blair, 1995). In addition, the psychological benefits attributed to physical activity include enhanced mental performance, improved self-image, increased confidence, greater sleep quality, and a reduction in the perceived feelings of anger, time urgency and pressure (DiLorenzo et al., 1999).

Tai, Gould and Iliffe (1997) reported that for older adults, physician advice about the benefits of exercise may have a greater impact than information from other sources. Therefore, physicians should be especially cognizant of the impact they can make by counseling their aging patients to engage in regular physical activity. Although the majority of physicians value the concept of physical activity, several obstacles prevent the routine discussion of this topic with patients as a preventive medical practice. Research has indicated that barriers to primary care interventions include: time limitations (Reed et al., 1991), lack of confidence in counseling skills (Dishman & Buckworth, 1996; Lewis & Lynch, 1993; Pate et al., 1995; Reed et al., 1991), perceived lack of patient motivation (Lewis & Lynch, 1993; Reed et al., 1991), restricted accessibility to materials to assist both the client and the physician (Hillsdon, 1998; Pinto et al., 1998), lack of financial remuneration for preventive counseling (Bull and Jamrozik, 1998; Calfas et al., 1996; Goldstein et al., 1999; Rosen et al., 1984), and effective (pragmatic) methods of recruiting patients (Hillsdon, 1998). Interventions designed to overcome these impediments and increase the rate of physical activity counseling by physicians have, for the most part, been less than successful (Dishman and Buckworth, 1996; Kreuter et al., 1997; Reed et al., 1991).

Swinburn and colleagues (1997) suggested that the value of the "exercise prescription" and advice from the physician would be enhanced with the appropriate follow-up procedures. This recommendation implies that a more intensive program of education and counseling may be required to move the sedentary population into action. There remains a need to examine whether other health professionals such as a nurse, a physiotherapist, or a physical educator are better able to promote exercise than a physician within a medical setting (Godin and Shephard, 1990). If patients are receptive to physician advice about increasing their physical activity, but physicians are unable, or unwilling to provide follow-up counseling, a physical activity intervention designed to target patients, with collaboration between the physician and another health professional may be more pragmatic. A successful intervention will require a subtle balance between educating patients about the real nature of physical activity, and providing information and support that will enable them to adopt and maintain behavior over time (Biddle & Fox, 1998).

A challenge to those who espouse exercise for health promotion is collaborating with sedentary individuals to maintain the newly adopted exercise behavior. Many of the physical activity interventions in primary care have been established without the identification and consideration of the psychosocial determinants of physical activity in the targeted population (Logsdon et al., 1989; Lewis and Lynch, 1993; Stevens, Hillsdon, Thorogood & McArdle, 1998; Swinburn et al., 1998). Consequently, both the research protocol and the intervention content may not have been appropriate, and therefore, less successful. Knowledge of the determinants of physical activity is essential for improving health promotion strategies and developing promising interventions. When the reasons fundamental to the success, or failure of a program remain obscure, it is difficult to generalize intervention strategies to other populations. It is imperative that physical activity interventions utilize recognized theories of human behavior to develop programs that can be assessed, and the underlying rationale for the success or failure of a program can be determined.

Theoretical Basis

One theory that has proven particularly effective in understanding the processes by which health behaviors are adopted is the Theory of Planned Behavior (TPB). The TPB has been shown to have good predictive ability (30% or more of the total variance explained) in the study of exercise (Gatch and Kendzierski, 1990; Godin, Valois and Lepage, 1993), smoking (Godin, Valois, Lepage and Desharnais, 1992), weight loss (Schifter and Ajzen, 1985), breast self-examinations (DeVellis, Blalock and Sandler, 1990), and dental care (McCaul, Sandgren, O,Neill and Hinsz, 1993).

The TPB focuses on the relationship of a person's attitude toward a behavior, subjective normative beliefs, perceived behavioral control to behavioral intention and behavior (Ajzen and Madden, 1986) (see Figure 1).

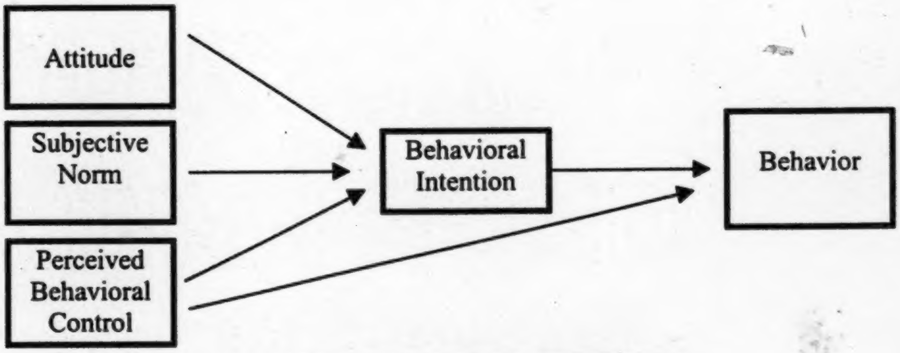


Figure 1 - Theory of Planned Behavior (Adapted from Godin, 1995)

The theory presumes that other factors, such as demographics and environment, function through the model constructs and do not independently contribute to explaining behavior (Godin, 1995). A person's behavioral intention is the most important determinant of behavior. Behavioral intention is successively determined by three conceptually independent variables. The first variable, titled attitude, is determined by the person's beliefs about the outcomes of performing a behavior, weighted by the positive or negative evaluation of performing that behavior. For example, a person who holds strong beliefs that mostly positive outcomes will result from becoming more physically active will have a positive attitude toward that activity.

A second variable, subjective norm, is determined by a person's normative beliefs—whether important referent individuals will approve or disapprove of performing the behavior, weighted by the motivation to comply with those referents. In a recent study, Courneya and McAuley (1996) noted that subjective norm has been operationalized with two conceptually distinct definitions. In a broad sense, subjective norm is "the perceived social pressure to perform or not to perform the behavior" (Ajzen, 1993). For example, a person who believes that their physician thinks he/she should be more physically active, and who is motivated to meet the physician's expectations, will hold a positive subjective norm. From a more narrow perspective, subjective norm has been defined as the perception that significant others think one should perform or not perform the behavior (Ajzen & Fishbein, 1980).

Researchers have sometimes mislabeled subjective norm, or have used the term interchangeably with social support. Previous research investigating the social support/exercise behavior relationship applied measures of spousal approval (Andrew, Oldridge, Parker, Cunningham, Rechnitzer & Jones et al., 1981; Daltroy & Gaston, 1989), and therefore, were seemingly tapping subjective norm rather than social support. More modern approaches to this question have assessed social support, but labeled it subjective norm to fit within the TPB (Wankel, Mummery, Stephens and Craig, 1994).

These researchers argued that subjective norm and social support represent an underlying construct pertaining to social influence, and consequently, a distinction was not necessary (Courneya & McAuley, 1996).

This confusion among researchers is due in part to the disagreement as to the conceptual definition of social support (Courneya and McAuley, 1996). Wallston, Alagna, Devellis, and Devellis (1983) proposed a comprehensive definition that social support is characterized by the comfort, assistance, and/or information one receives through formal or informal contacts with individuals or groups. Subjective norm is concerned with the perceived social pressure to perform or not perform a behavior, whereas social support refers to the provision of encouraging or helping behaviors (Courneya & McAuley, 1996). For instance, an individual might perceive pressure from an individual, or group to perform a behavior, but might not perceive any support from them toward performing the behavior. Therefore, it is imperative that the operationalization of subjective norm and social support be clarified when attempting to manipulate these constructs.

Social support was originally conceptualized as a unidimensional construct, but more contemporary efforts have broken down social support into component functions (Cutrona & Russell, 1987). Weiss (1974) proposed that people seek particular types of social support in their relationships. Six types of social support were identified, and referred to as the "provisions of social relationships" (Weiss, 1974). Attachment includes feelings of affection, intimacy, and security, as found in a relationship with a spouse or close friend (Mancini & Bleiszner, 1992; Mullins & Dugan, 1991). Reliable alliance is knowing that one can count on receiving instrumental assistance (eg., emergency, or the loan of money) in times of need (Mancini & Bleiszner, 1992; Mullins & Dugan, 1991). Enhancement of worth concerns the recognition and affirmation of a person's value, typically obtained from work colleagues (Mancini & Bleiszner, 1992; Mullins & Dugan, 1991). Social integration depends upon the way, and extent, to which a person is part of a social network (Mancini & Bleiszner, 1992; Mullins & Dugan, 1991). Guidance involves relationships with people who can provide advice, knowledge and expertise (Mancini & Bleiszner, 1992; Mullins & Dugan, 1991). Opportunity for nurturance is taking care of others and can be typified, among older persons, by the care-giving responsibilities one might assume for a disabled spouse (Mancini & Bleiszner, 1992; Mullins & Dugan, 1991).

Weiss (1974) proposed that special relationships might provide various social provisions. For example, marriage might provide all of the social provisions, but especially those of attachment, social integration, guidance and nurturance (Mullins & Dugan, 1991). Other kin provide a person with the provisions of reliable alliance, guidance, and social integration. It is generally believed that family members, especially children, seem to contribute more than friends to the well-being of older people—providing emotional support, health care, financial support, and emergency assistance (Adams, 1968; Mancini, 1989). Recent studies have indicated that friendship relationships emerge as more important than children to older people's physical and psychological well-being (Dean, Kolodny & Wood, 1990; Mullins & Dugan, 1990). For example, Lee and Ellithorpe (1982) found no support for the relationships between the emotional well-being of the elderly and the frequency with which they interact with their children. Friendships appear to have a remarkably significant worth, and may also mirror a person's consistent ability to connect with others in a rewarding and mutually satisfying manner (DiTommaso & Spinner, 1997). Mullins and Dugan (1991) reported that contact with adult children was important to the older person's sense of self, but only with respect to the opportunity for the parent to provide the support. Caron, Tempier, Mercier and Leouffe (1998) suggested that the availability and satisfaction with social support contributed significantly to the psychological well-being of middle-aged adults. In addition, a number of researchers have found correlations between perceived quality of life and social support (Andrews, Tennant, Hewson & Vaillant, 1978; Bowling, Farkhar, Grundy & Formby, 1990; Caron et al., 1998; Klein, 1993).

A third conceptually independent variable, perceived behavioral control, indicates the perceived ease or difficulty of performing the behavior. Perceived behavioral control (PBC) accounts for the factors both within and outside the individual's control that may affect intention and behavior (Ajzen and Madden, 1986). If an individual can decide at will to perform, or not perform, a behavior, they are said to be under complete volitional control (Ajzen and Madden, 1986). However, when the behavior is unpredictable due to the possession of adequate resources, or appropriate opportunities, the less the behavior is under volitional control (Ajzen and Madden, 1986). The particular resources and impediments that are to be measured are not specified by the theory, but are described by the particular population and behavior under investigation. When the behavior is under complete volitional control and an individual's perceptions of control are accurate, PBC can provide meaningful information for the prediction of the target behavior (Madden, Ellen and Ajzen, 1992).

Operationalization and Measurement

A comprehensive computerized search of the recent English language literature was undertaken to identify the current TPB research. A number of available databases were searched including Medline, PsychINFO, and Best Evidence using the key terms, TPB, intervention, behavior change, health promotion and physical activity. The TPB has been used extensively to study various behaviors (leisure activities, attendance in class, low-fat diet, health-check attendance, driving violations, breast self-examination, and travel mode choices), in a number of populations (students, hospital workers, older adults, professional management personnel, corporate employees, military beneficiaries, and physicians), with varied results (Refer to Appendix M). Among the 19 published studies reviewed, attitude contributed to a significant portion of the variance in intention to perform a number of behaviors (Ajzen and Driver, 1993; Ajzen and Driver, 1994; Armitage and Conner, 1999; Millstein, 1996; Norman and Conner, 1996; Parker, Manstead and Stradling, 1995; van Ryn, Lytle and Kirscht, 1996). The construct of subjective norm is perhaps more difficult to measure, and is therefore, not quite as useful for predicting behavioral intention. However, a number of studies did report significant results with respect to the influence of social pressure on behavioral intention (Armitage and Conner, 1999; Millstein, 1996; Nguyen, Otis and Potvin, 1996; Parker et al., 1995; van Ryn et al., 1996). The most robust predictor of behavioral intention is perceived behavioral control (PBC). In many of the studies reviewed, PBC was an independent significant predictor of behavioral intention (Ajzen and Madden, 1986; Armitage and Conner, 1999; Brenes, Strube & Storandt, 1998; Madden, et al., 1992; Parker et al., 1995; Verplanken, Aarts, Knippenberg and Moonen, 1998). Results of these studies provide support for the usefulness of the TPB for predicting intention in various behaviors, and populations.

Different theoretical frameworks have been applied to the study of exercise behavior among different segments of the population. However, the TPB is the most validated social-cognitive model for analyzing exercise behavior and determining why people are physically active (Ajzen and Driver, 1993; Brenes et al., 1998; Courneya and McCauley, 1995; Godin et al., 1993; Kerner and Grossman, 1998; Kimiecik, 1992; Madden et al., 1992; Michels and Kugler, 1998; Terry and O'Leary, 1995). The primary strength of the TPB is that it provides a framework for identifying, measuring, and combining beliefs that are relevant to individuals or groups. Each variable in the model can be studied as a predictor of intention by examining the cognitive responses to statements in questionnaires completed by participants. Practitioners and researchers can then design physical activity interventions to target and change these beliefs, thereby affecting attitude, subjective norm and PBC and inducing a change in intention and behavior.

An intervention grounded in the TPB will facilitate the design, as well as the selection of the components implemented to increase the level of physical activity in sedentary 40-70 year old adults in a medical clinic setting. The TPB is known to predict physical activity in various populations (Ajzen and Driver, 1993; Brenes et al., 1998; Courneya and McCauley, 1994; Godin et al., 1993; Kerner and Grossman, 1998; Kimiecik, 1992; Terry and O'Leary, 1995). The theory will also help to determine if the intervention was successful by assessing the attitudes, perceived behavioral control, and barriers reported by the participants. Attitudes will be measured by assessing the beliefs and evaluations concerning the perceived consequences of physical activity. Several researchers have reported that attitudes predicted behavioral intention for physical activity and exercise (Courneya and McAuley, 1995; Godin et al., 1993; Kerner and Grossman, 1998; Kimiecik, 1992; Michels and Kugler, 1998; Terry and O'Leary, 1995).

There is a noted discrepancy among studies in the definition and operationalization of PBC (Armitage and Conner, 1999; Conner and Armitage, 1998; Courneya and McAuley, 1995; Terry and O'Leary, 1995). The TPB predicts two possible effects of PBC on behavior (Madden et al., 1992). In the first instance, PBC represents a possible motivational factor that has an indirect effect on behavior through intention. This aspect of PBC is characterized by personal control over internal resources, such as confidence, skills or ability, and is synonymous with Bandura's (1986) concept of self-efficacy. In the second scenario, PBC reflects actual control over resources and opportunities and has a direct link to behavior not mediated by intention (Conner and Armitage, 1998; Terry and O'Leary, 1995). This second interpretation is generally measured directly concerning the targeted behavior and is called PBC. Lately, however, concern regarding self-efficacy or PBC over other events that might impede physical activity, i.e., barriers, has risen. It is possible, for example, that a person might feel she/he has control over her/his exercise behavior and is self-efficacious for performing it, but is unable to overcome barriers such as work obligations. Therefore, the presence of barriers will be assessed as well as self-efficacy for overcoming them. It is expected, for example, that individuals with low PBC will probably indicate they can not overcome barriers, whereas individuals with high PBC may indicate a similar frequency of barriers, but higher confidence for overcoming them.

Within the TPB research, there is increasing evidence to support the theoretical discrimination between self-efficacy and PBC (Armitage and Conner, 1999; Brenes et al., 1998; Courneya and McAuley, 1995; Terry and O'Leary, 1995; van Ryn et al., 1996). These studies covered diverse behaviors (e.g., low-fat diet, exercise, and breast self-examination), in disparate populations (e.g., hospital workers, older adults, undergraduate students, and telephone company employees). The results from these studies suggest that the self-efficacy—PBC differentiation is robust. Conner and Armitage (1998) reported that there is a strong relationship between self-efficacy and behavioral intention: People intend to engage in behaviors of which they feel they are skillful.

However, when self-efficacy and PBC are measured simultaneously, predicting behavior becomes more difficult. For example, Terry and O'Leary (1995) determined that PBC, but not self-efficacy predicted exercise behavior. To further illustrate this difficulty, Manstead and van Eekelen (1998) reported that self-efficacy, but not PBC was a significant predictor of grades achieved in English. Given that behaviors are on a continuum of volitional control, it is not surprising that there is discrepancy in the prediction of behavior. Janis (1983) and Meichenbaum (1985) both assert that the degree to which setbacks or barriers are anticipated and prepared for is an important predictor of success in adherence to difficult or complex decisions and behaviors, independent of self-efficacy. Therefore, it would be sensible to address both constructs: self-efficacy (internal resources) and PBC (external constraints) when attempting to change behavior. Once external barriers have been identified, it would be necessary to determine which constraints would be controllable. Subsequently, the individual's self-efficacy for overcoming those barriers would be employed.

In summary, the TPB proposes that people will intend to perform a behavior when they evaluate it positively, believe that significant others with whom they wish to comply think they should perform it, and perceive it to be under their own control (Ajzen, 1988). The relative influence of attitude, subjective norm, and PBC are determined empirically for each particular behavior and population under investigation (Montano, Kasprzyk & Taplin, 1997). Theory based research will also make it possible to ascertain whether the physicians involved in the study were influential by measuring the subjective norm component of the TPB.

REVIEW OF LITERATURE

Physical Activity

Benefits. In 1992, the American Heart Association declared physical inactivity as an independent risk factor for cardiovascular disease, equal to that of smoking (Fletcher, et al., 1992). In addition, sedentary behavior can be linked to a substantial portion of deaths due to coronary heart disease (Blair, Kohl, Paffenbarger, et al., 1989; Paffenbarger et al., 1986) type II diabetes (Helmrich, Raglund, Leung, and Paffenbarger, 1991) and colon cancer (Lee, 1994). For example, Health Canada (1999) estimated that 25% of the deaths due to heart disease in 1993 could be attributed to sedentary living.

In addition to preventing chronic disease, enhancing physical fitness may be an advantageous medium to investigate the connection between an active lifestyle and physical functioning (Huang, Macera, Blair, Brill, Kohl, and Kronenfeld, 1998). Physiologic measures are promoted for their objectivity, but do not necessarily reflect the way the patient feels and functions (MacKeigan and Pathak, 1992). Physiologic measures provide information useful to clinicians and researchers, but may be of limited interest to patients (Guyatt, Feeny, and Patrick, 1993; MacKeigan and Pathak, 1992). These measures often correlate poorly with well-being and functional capacity, the areas of most concern to patients (Guyatt et al., 1993).

The World Health Organization's (WHO) definition of health is a state of "complete physical, mental and social well-being, and not just the absence of disease" (World Health Organization, 1958). Although health-related quality of life is not a well-defined concept, it is usually thought of as the ability to perform significant activities and function well in daily living life from the patient's perspective (Grimby, 1995; Grimm, Grandits, Cutler, Stewart, McDonald, Svendsen, et al., 1997). Health-related quality of life is a multidimensional construct that represents the individual's overall perceived satisfaction with life, and its assessment typically involves measures of functional status (physical, mental and social), physiologic status, perceptions of well-being, and general life satisfaction (Grimby, 1995; Grimm et al., 1997; Laforge, Rossi, Prochaska, Velicer, Levesque, and McHorney, 1999; MacKeigan and Pathak, 1992).

As individuals age, deterioration in function and the restriction in performance of daily living activities serve to reduce their sense of control (Mazzeo, Cavanagh, Evans, Fiatarone, Haberg, McAuley, et al., 1998). A sense of personal agency (control) is vital to both physical and psychological health. Many of the transformations that are commonly attributed to aging are caused by disuse, and as such, are preventable (Bortz, 1982). There is evidence that physical activity can have a positive influence on different dimensions of health-related quality of life (Rejeski, Brawley, and Schumaker, 1996). Grimby (1995) reported that good physical performance and maintained functional ability in various daily living activities enhanced the general well-being of the aged person. Ruuskanen and Ruoppila (1995) found significant relationships between self-rated health and increased physical activity. Regular physical activity was also significantly associated with a lower prevalence of depressive symptoms in 65 to 75 year old adults (Ruuskanen and Ruoppila, 1995). Physical activity improves muscle strength, which improves mobility, which in turn decreases the risk for falls (Buchner, 1997). In a qualitative study, the overriding sentiments of the participants were that physical fitness was a broader construct, more in keeping with the WHO definition of health in general (Devereaux, Futrell, and Williamson, et al., 1996). Participants also stated that physical fitness was an essential component in the concept of wellness and functional independence (Devereaux et al., 1996).

Since modification of self-perception of the benefits of regular exercise is an important motivational strategy used in many exercise promotion interventions, it is meaningful to study whether, or to what degree, self-perception of quality of life varies when physical activity levels are increased (Laforge, et al., 1999). Previous research has indicated that physically fit people live two to three years longer and have a better quality of life than sedentary individuals (Butler, Davis, Lewis, Nelson, and Strauss, 1998). Therefore, the initiation and maintenance of long-term light-to moderate-intensity physical activity programs for older adults may reduce the rate of age-associated deterioration, which, in the long-term, should increase both quantity and quality of life (Bortz, 1982; Mazzeo et al., 1998). The quality and quantity of life in older adults are best accomplished by adding aerobic forms of exercise such as swimming, cycling and walking to an individual's habitual lifestyle (Mazzeo et al., 1998).

Recommendations. Public health authorities have realized that many health benefits from physical activity can be realized even at lower intensities of exercise (American College of Sports Medicine, 1998; Australian Sports Commission, 1997; Depres and Lemarche, 1994; Health Canada, 1998). Health Canada recommends that people accrue 30 - 60 minutes of activity every day (Health Canada: Questions, 1998). A variety of activities should be chosen from each of the three activity groups—endurance, flexibility and strength, and can be accumulated in periods of at least 10 minutes each. Emphasis should be placed on the factors that result in a permanent lifestyle change to encourage a lifetime of physical activity and increased well-being.

Health Canada (1998) would like Canadians of all ages to seriously consider their present activity levels and to become more physically active to sustain better health.

Prevalence. Simple changes to activity levels are within the capacity of most Canadians, but regretfully this often does not occur. Two-thirds of Canadians aged 25-55 are not physically active enough to meet the recommended physical activity guidelines set forth by Health Canada (Health Canada: Facts, 1998). Inactivity increases the risk of premature death, chronic disease and disability and therefore places an unnecessary liability on the public health-care system. The message is clear—Canadians need to take more responsibility for their health by adopting a more physically active lifestyle.

Health-Care Utilization and Older Adults

Senior Population. The prevalence of illness increases with age, as does the use of medical services. The elderly (persons 65 years of age or over) carry by far the greatest proportion of chronic disease burden, disability, and health-care utilization (Hoffman et al., 1996). Approximately 88% of those people over age 65 have a minimum of one chronic health condition, but many others also suffer from reduced mobility and well-being (Hoffman, et al., 1996). In 1997/98, patients aged 65 and older accounted for 35% of the three million discharges reported by Canada's in patient hospitals. Although seniors represented only 12% of the population that year, they accounted for 52% of the 21 million patient days. Seniors were over-represented in all leading causes of hospitalization, and accounted for almost one-third of all primary procedures performed in hospitals in 1997/98 (Canadian Institute for Health Information, 2000).

Demographic Shift. The elderly also constitute one of the fastest growing population segments among industrialized countries (King, Rejeski, and Buchner, 1998). In 1998, people over 65 years of age represented 12.3% of the Canadian population (Canadian Institute for Health Information, 2000). Statistical projections for the year 2011 estimate that 14.1% of Canadians will be over 65 years of age (Minister of Industry, 1999). If the medical care of seniors is responsible for a large portion of the health-care cost, and the proportion of people over the age of 65 is expected to increase, how might Canadians help mitigate the economic consequences?

Preventive Medicine. One possible solution would be to take preventive action now. The loss of physical functioning can be evident by the fifth decade of life (Huang et al., 1998), which argues for more preventive approaches before therapeutic treatment is necessary (Bull and Jamrozik, 1998). Regular physical activity has been demonstrated to promote health and limit disability in the later years of life (Buchner and Wagner, 1992).

The elderly present a number of challenges to the health care system, many of which are concerned with the declining functional capacity associated with aging (Barry and Eathorne, 1994). The activity patterns in elderly people depend on previous activity levels, particularly during middle age (Frandin, Mellstrom, Sundh, and Grimby, 1995), and interventions should be made in younger age groups to ensure an active and independent elderly population in the future (Grimby, 1995). Physical activity has been repeatedly identified as a protective factor for functional limitation in the elderly, but is also important for maintaining functioning for middle-aged men and women (Huang, et al., 1998). Butler et al., (1998), suggested that the target of physical activity interventions should be the 55-65 year old age group, because they are the people slowing down who will have problems in later life. A well-designed physical activity program may be the single, most cost-effective means of maintaining physical functioning (Barry and Eathorne, 1994).

A 1% increase in physical activity could save over $11.5 million (in constant 1993 dollars) for heart disease, adult-onset diabetes and colon cancer each year (Health Canada: Questions, 1998). Small gradual changes in activity behavior seem to be more achievable for the sedentary population (Stevens, Hillsdon, Thorogood, and McArdle, 1998). As a method of encouraging sedentary individuals to become more active, lifestyle physical activities are promoted. Active Living Canada is concentrating efforts on changes in lifestyle that are achievable and sustainable (Health Canada: Questions, 1998), because a small increase in physical activity for a large number of people can represent a substantial improvement in the health of the population.

Primary-Care Intervention

Recommendations. Numerous approaches have been employed to modify physical activity behavior in the sedentary population in an attempt to solve this major public health problem. After reviewing the existing literature in this area, the U. S. Preventive Services Task Force (1989) recommended that physicians counsel all patients to adopt a program of regular physical activity. More recently, the president of the College of Family Physicians in Canada, Dr. Francine Lemire, welcomed the opportunity to assist Health Canada in developing strategies to promote physical activity to Canadians (Health Canada: Speaking, 1998). Family physicians provide most of the health-care services to most of the population because many families turn to their physician for advice on health and medical concerns. The potential for physicians to motivate their sedentary clients to adopt a more physically active lifestyle is an appealing approach to preventive health promotion. However, the scientific evidence related to such an approach is modest at best (Eaton and Menard, 1998; King, Sallis, Dunn, Simons-Morton, Albright, et al., 1998).

Physicians may endorse the value of physical activity for their clients, but the reported rates of counseling are generally quite low (Reed et al., 1991; Wallace, Brennan, and Haines, 1987; Wells, Lewis, Leake, Schleiter, and Brook, 1986). When physicians do provide counseling for physical activity, it is more likely to occur for therapeutic reasons with a high-risk client (Swinburn et al., 1997) rather than for preventive motives with presumably healthy clients during a routine check-up (Rosen et al., 1984). From the perspective of population-based medicine, this lack of intervention eliminates the opportunity to reduce the need for therapeutic counseling in the future.

Physician Counseling. The following review of literature considers the evolution of the research that has been conducted to assess the efficacy of primary care physicians promoting physical activity. Only studies that involved physicians as the information provider, and sedentary patients that were in good general health were considered for this review. As this is a very new approach to increasing physical activity in the general population, only ten randomized controlled, or quasi-experimental studies were located for the review (Refer to Appendix N). The research studies reviewed will be discussed in a chronological order to follow the progression of work in this area.

Reid and Morgan (1979) hypothesized that adherence to regular exercise over a period of six months would increase when the exercise prescription included: a) printed exercise instructions and a ten minute consultation with a physician; b) a one-hour period of film and discussion; and 3) knowledge of pulse taking, quantifying, recording of daily exercise, and reporting of this information. The study was grounded in the Health Belief Model, which asserts that the plausibility of adopting a behavior befitting the prevention or control of some disease, depends upon the individual's perception of a threat to personal health, and the confidence that the recommended action will reduce this threat (Rosenstock, Strecher, and Becker, 1988).

The researchers wished to maximize the potential for prescription adherence, and therefore, selected an unrepresentative, presumably well-motivated, but sedentary population. One hundred twenty four fire fighters, aged 24 to 56, volunteered for the study. After completing a sub-maximal bicycle ergometer stress test, each participant met with a physician to discuss his performance and relative fitness when compared with the American Heart Association recommended levels. Following the ten-minute consultation, the physician provided the participant with a copy of the Physical Activity Readiness Questionnaire (PAR-Q), and a one page guide called the "Half as much" for the new exerciser to begin a safe, graduated program. The control group (n = 47) received no further instructions. Group 2 (n = 47) and Group 3 (n = 30) watched a film and were given written and verbal information about why and how to exercise from a health educator. Group 3 was also taught how to monitor their physical activity and was instructed to forward weekly reports to the research office.

Physiological measures from the VO_2 maximum estimations and physical activity self-reports were combined to produce a compliance index. An exercise complier was reported to exercise at least twice a week and increased their predicted VO_2 maximum 9.5% or more. At three months, 29% of the control group (n = 47) was considered to be compliers. There were no significant differences between Group 2 and Group 3, and the data was then collapsed. The intervention groups (n = 77) had significantly more compliers as 55% had met the criteria. However, at the end of six months, the control group contained the highest proportion of compliers and the greatest physiological change (26%). Group 2 and Group 3 actually lost 40% of their compliers at the end of six months (32%). Regardless of the treatment group, approximately one third of the study population adhered to regular exercise at six months.

Rosen, Logsdon, Demak (1984) continued the research that evaluated the effectiveness of physical activity counseling by primary care physicians. Limited information was made available from the Insure Project on Lifecycle Preventive Health Services. A portion of the project assessed the short-term affects of the program primarily in terms of attitudinal and health behavioral change of patients, and secondarily, by attitudinal and practice change among physicians. Insure was a nonrandomized intervention trial that involved 4500 patients and 100 physicians from 6 primary care clinics. Physicians at 3 of the clinics received brief training to administer various health interventions, including physical activity counseling. The data indicated that 35.9% of patients at one of the sites had begun a program of regular physical activity whereas 28.2% had done so at a control site. Measures of physical activity were not reported in the study. The impact of the intervention in this case, although small, offered evidence that a positive effect could be obtained. With regard to the physician counseling of physical activity, 6.6% never or rarely discussed exercise, 63.9% counseled only high-risk patients, and 29.5% reported discussing exercise with all of their patients. These results support the notions that while physicians frequently promote physical activity with their patients (Dishman and Buckman, 1996; Kreuter et al., 1997; Reed et al., 1991), but generally only for therapeutic reasons (Kreuter, et al., 1997).

Lewis and Lynch (1993) examined the short-term effectiveness of a tri-faceted intervention in one family practice in Colorado. The intervention included brief physician advice to exercise, distribution of a patient handout, and the promise of a one-month telephone follow-up from a staff person. Twenty-four residents participated in a randomized clinical trial, designed to evaluate the efficacy of a physician advice protocol, to increase the frequency and duration of self-reported activity levels. Of the 396 patients admitted to the study, 139 (35%) refused to cooperate and 47 (12%) were lost to follow up, resulting in 210 (53%) participants. Baseline measures indicated that 277 (70%) of the patients were exercising before the intervention, and that many (30-40%) of the control group doctors were already promoting physical activity in their practice. For this reason, a quasi-experimental design was adopted to assess the effect of physician advice (intervention group) versus no advice (control group) on increasing physical activity levels. Self-reported results for physical activity indicated that participants in the physician advice group were significantly higher at the end of one month. However, this increase appeared to be related to the duration only, and not the frequency of exercise. A limitation of this study is the high rate of exercise, over 70% at baseline, which limits the generalizability of these findings.

Pinto, Goldstein, and Marcus (1998) have postulated that an effective counseling message should be based on empirical data from trials of physical activity counseling interventions. However, research conducted within a theoretical framework on activity counseling in health-care settings is deficient (Blair, et al., 1998). One exception in this regard was the development of the Physician-based Assessment and Counseling for Exercise (PACE) intervention which was guided by behavioral science theories and data on the determinants of physical activity (Calfas, et al., 1996). The intervention is based on two models of health behavior change: Transtheoretical Model and Social Cognitive Theory. PACE was planned to impact the social and psychological factors known to influence physical activity, such as increased social support, self-efficacy and awareness of the benefits of activity (Marcus, et al., 1997).

Targeted personal factors in the PACE intervention include cognitions, emotions, self-regulatory behavioral skills, enjoyment of physical activity, perceived benefits of and barriers to physical activity, and skills related to overcoming barriers to physical activity (Calfas, Sallis, Oldenburg, and Ffrench, 1997; King et al., 1998). Within the cognitive domain, the most important mediator of behavior is hypothesized to be self-efficacy, or one's confidence to perform specific behaviors in particular circumstances (Marcus, et al., 1997). The social environmental mediators targeted in the PACE intervention include social support directly related to physical activity participation and modeling of physical activity by others (King, et al., 1998).

PACE intervention components include physician training in brief counseling, chart prompts to support physician counseling, algorithms to enhance counseling messages, customized physical activity prescriptions, patient guidebooks, and follow-up visits specifically for physical activity counseling (Marcus, et al., 1997). The PACE materials and training follow a structural protocol to assist physicians with physical activity counseling by removing the barriers reported in the past (Calfas, et al., 1996). A nurse categorizes patient-readiness to adopt physical activity, before the office visit begins, to enable physicians to better meet the needs of their patients (Calfas, et al., 1996). Health educators provide additional booster counseling via telephone and/or personal follow-up, and are an integral part of the primary care team (Marcus, et al., 1997).

Calfas, et al., (1996) conducted a controlled trial of physician counseling to promote the adoption of physical activity. Seventeen doctors' offices in San Diego County volunteered to adhere to the PACE protocol for this investigation. Sedentary patients were defined as engaging in vigorous physical activity less than three times a week or moderate activity for less than two hours a week. Participants, who were over 18 years of age and free of coronary heart disease or other circumstances that could limit mobility, were recruited for the study. A 52% response rate (n = 212) was obtained after six weeks of follow up. The intervention used a patient centered, stage of change approach to increase levels of physical activity. Of those patients in the intervention group, 52% moved from contemplation to the active stage compared with 12% of the control group. The intervention group increased their physical activity by 37 minutes a week compared with 7 minutes a week in the control group ($p < .05$). However, patients reported walking an average of only 11 minutes a day. In light of the short-term follow up in this study, the relevant health benefits of this intervention are questionable. In addition, this study represents a best case scenario that may not be applicable to most primary care office practices. Many physicians are unwilling to devote the extra time and energy required to implement this type of intervention.

Marcus, et al., (1997) completed a similar intervention using the PACE protocol. A sequential comparison group design was used to investigate the change in self-reported physical activity between experimental (counseling and self-help material) and control (usual care) patients at baseline and six weeks after the initial office visit. A convenience sample of four physicians, in one primary care office practice in Providence County, Rhode Island, agreed to participate. Of the 117 people eligible to participate, 63 (54%) agreed to participate, and 44 (38%) actually completed the study in its entirety.

The intervention included four major components: 1) physician training (1 ½ hours) in office-based counseling intervention, 2) individualized patient counseling (3 to 5 minutes) and education/behavioral change materials based on the Transtheoretical Model and Social Cognitive Theory, 3) physician office support system, and 4) monitoring/follow-up. Results indicated that training physicians to activity counsel could increase the short-term adoption of physical activity in sedentary middle-aged and older patients (mean age 67).

Limitations of this pilot study included the small volunteer sample of physicians, the short-term follow-up, the use of a sequential design, and the one time delivery of the intervention at a single visit. Another limitation of this study was the use of only one practice site, which reduced the generalizability of the results to other settings. More work needs to be done to evaluate the short- and long-term effectiveness of physician-delivered exercise promotion.

The Activity Counseling Trial (ACT) was a multi-center, randomized controlled trial to appraise the efficacy of improving physical activity interventions in the primary health care setting (Blair, et al., 1998). ACT was the first large-scale longitudinal study of physical activity counseling that included a generalizable sample of adult participants in a variety of clinical settings. ACT recruited, evaluated, and randomized 874 men and women (mean age 51) who were patients of primary care physicians.

Participants were randomly assigned to one of three educational interventions that differed in the amount of interpersonal contact and resources: standard care control, staff-assisted intervention, or the staff-counseling intervention. The three conditions represented a hierarchy, with all of the components in standard care control included in the staff-assisted condition, and all those in the staff-assisted condition included in the staff-counseling intervention. All three groups received the same physician advice to increase their physical activity and were provided with the current recommendations for physical activity. The staff-assisted condition and the staff-counseling condition were also provided with behavior change strategies to help them meet the current recommendations for physical activity. The difference within these two groups was the type and frequency of contact. The staff-counseling intervention represented a more staff-intensive intervention approach requiring interpersonal contact and counseling.

This intervention was also grounded in the Social Cognitive Theory (SCT) and the Transtheoretical Model. An addition to this intervention was the Self-Regulation Model of behavior change, which is derived from SCT and has been applied to many behaviors. Teaching participants to apply self-monitoring, self-evaluation, and self-reinforcement through goal-setting, positive self-talk, and problem solving was expected to enhance their abilities to integrate physical activity into their daily lives. Therefore, the results from the five-year ACT study have the potential to make substantial contributions to the understanding of how to promote physical activity in the primary health care setting. The results of the ACT intervention, however, have not been published to date.

In a primary health care setting, Bull and Jamrozik (1998) were also interested in testing the effectiveness of verbal advice on exercise from a family physician (FP) combined with supporting written information. A randomized controlled trial using a balanced design based on day of the week was reported, with subjects allocated to a control group or one of two intervention groups. The intervention involved ten general practices in Perth, Western Australia. All adult patients consulting a family physician completed a screening questionnaire (n = 6351). After determining eligibility to the study, sedentary adults (N = 763) were recruited to the project.

Participants received verbal advice on exercise from the family physician at the time of the scheduled appointment. Within two days of the visit to the doctor, a pamphlet on exercise was mailed to the patient's home address. The response to follow-up, via the postal survey at one, six, and twelve months after the initial consultation was 70%, 60%, and 57%, respectively. At one month a sub-sample of the control and intervention subjects were contacted for a telephone interview to verify self-reported levels of activity (n = 136). All non-responders to the postal surveys were treated as sedentary. At each follow-up, subjects were categorized as "now active" if they reported engaging in at least one episode of physical activity in the previous two weeks. At one month, significantly more subjects in the combined intervention groups reported doing some physical activity (40%) compared with the control group (31%). In addition, just over one fifth of the "now active" control participants reported undertaking at least the recommended level of exercise in the previous two weeks (66%, 1-6 sessions; 12%, 7-9 sessions; and 22%, 10 or more sessions. The combined intervention groups reported over one third of the subjects (36%) physically active for 10 or more sessions during the previous two week period which was significantly more than those in the control group. At six months, 30% of the control group and 38% of the combined intervention groups were "now active." However, there was very little change at follow-up at twelve months (31% control and 36% intervention groups, respectively). A limitation of this study is the degree of non-response to the postal surveys. It might be argued that those that do respond may be the healthier patients, or patients who have made a change in their behavior.

More recently, Stevens, Hillsdon, Thorogood, and McArdle (1998) considered the cost-effectiveness of a "Prescription for Exercise" scheme in a randomized controlled trial. The aim of the scheme was to increase the levels of physical activity in sedentary people aged 45-74. The study location was from two west London general practices. Of the 714 patients identified as inactive, 363 were randomized to receive an invitation for a consultation with an exercise development officer (intervention group) and 351 were randomized to receive an information packet on leisure centre facilities in the hospital (control group). The difference between this study and other trials reported in the literature is that general practitioners were not directly involved in either the recruitment of subjects, or the intervention itself. The intervention subjects were sent a letter from their general practitioner inviting them to attend a consultation with an exercise development officer at the local leisure centre, which was centrally located within the ward.

Of the 363 subjects in the intervention group, only 126 (35%) attended the first consultation with the exercise development officer. Ninety one subjects (25%) returned for the second consultation at the end of the 10 week exercise program. Both moderate and total numbers of occasions of physical activity were significantly greater in the intervention group. However, it should be noted that measures of physical activity were self-reported. Eight months after the intervention, a follow-up indicated that there was a net 10.6% reduction in the proportion of people classified as sedentary in the intervention group compared with the control group.

The "Green Prescription" was also a randomized clinical trial that was designed to ascertain whether written advice from a physician was more effective at increasing physical activity among sedentary patients than verbal advice alone (Swinburn, Walter, Arroll, Tilyar, and Russell, 1998). This study trained general practitioners to assess and prescribe physical activity in 37 general practices in Auckland and Dunedin, New Zealand. Patients undertaking less than one hour of vigorous activity or three hours of moderate activity a week were defined as sedentary. Those sedentary patients, over 18 years of age, who were likely to benefit from enhanced physical activity and who were able to do so for the six week intervention were recruited for the study. From this convenience sample of sedentary patients, 218 were randomized to written prescription and patient education materials (intervention) and 238 participants received only verbal advice. Assessment and counseling by the doctor lasted on average five minutes.

In this study, after six weeks of follow up, a statistically significant increase in physical activity was found in the intervention group (85% active) compared with the group that received verbal advice alone (76%). This increase in physical activity averaged 156 minutes per two-week period. However, the absolute levels of walking were greater in the verbal advice group (249 minutes per two weeks) at six weeks than in the intervention group (217 minutes per two weeks). The average level of physical activity for both groups (17 minutes of walking per day) is far below the recommended 30 minutes a day of moderate level activity. Therefore, the health benefits of this increase in physical activity are negligible.

After 11 months, the long-term benefits of the intervention were assessed by telephone interview. Only participants that successfully increased activity in the intervention group were contacted. Of those people, 59% had maintained their increased physical activity. Failing to follow up the control group and those that initially had not increased physical activity may invalidate the results of this eleven-month follow up data. Selecting patients during practice consultations rather than a random sample of patients also places significant restraints on the generalizability of these findings.

Goldstein, Pinto, Marcus, et al., (1999) have recently completed a randomized controlled trial called Physically Active for Life (PAL). Like the PACE project discussed earlier, PAL used a patient-centered model to compare the efficacy of brief physician-delivered physical activity counseling to usual care, on self-reported physical activity levels. The Transtheoretical Model and Social Learning Theory were integrated with the patient-centered approach to patient education wherein cognitive, attitudinal, instrumental, behavioral, and social issues were addressed through a series of questions and statements.

Twenty-four practices participated in the study—twelve solo practices and twelve group practices. Randomization of the practices produced seventeen physicians in the control group and seventeen in the intervention group. Physicians in the intervention practices received one hour of training in the delivery of brief physical activity counseling. Physicians in the intervention practices also received a 28-page manual, a desk prompt with summary information on counseling, and an office poster on physical activity promotion. These materials had been previously tested for acceptability in a pilot study (Marcus, Goldstein, Jette, et al., 1997).

Three hundred and fifty-five patients were enrolled in the study (Control n = 174; Intervention n = 181). The average age of the participants was 65.6 years and the majority women (65%). At the patient's initial appointment, a member of the research staff explained the study and obtained written informed consent. Prior to seeing the physician, each patient was then interviewed (average 5.8 minutes) to determine stage of motivational readiness for physical activity, physical activity preferences, and barriers to becoming physically active. The information collected by the research staff was placed on the patient's chart and used by the physician to guide his/her counseling to be appropriate to the patient's stage of readiness. As part of the study protocol, the physician wrote an exercise prescription and provided each participant with a stage-matched manual for physical activity. At a follow-up appointment, the physician was required to provide activity counseling and complete a new exercise prescription for the patient.

At six weeks, 89% of the intervention group was in Preparation/Action versus 74% in the control group. However, at eight months, 79% of the intervention group was in Preparation/Action versus 88% of the control group. Thus, the significant effects noted for the intervention for this subgroup at six weeks were not sustained at eight months.

One limitation of this study is related to the generalizability of the findings. Although 80% of the eligible patients were recruited into the study, the participants represented only 13% of the patients over 50 that were scheduled for appointments. In addition, six weeks after receiving the initial PAL intervention, only 67% of the participants recalled receiving the written PAL exercise prescription. This finding suggests that a more intensive intervention is required to ensure that the counseling message is retained. Given the constraints on physicians' time in the primary care setting, it may be more feasible for a nurse practitioner, or health educator to provide more intensive counseling and follow-up procedures to promote physical activity.

Critical Commentary. Three questions will be answered in this critical commentary. First, what sorts of interventions are superior? Secondly, what supplementary research is required? Third, what practice recommendations can be actualized?

To date, no physical activity interventions in the health care setting have been published in Canada. The majority of the primary care physical activity intervention studies have been conducted in the United States (Calfas et al., 1996; Goldstein et al., 1999; Graham-Clarke & Oldenburg, 1994; Marcus et al., 1997; Reid & Morgan, 1979). Behavioural theories/models that were the foundation for the intervention were described in six of the studies (Bull & Jamrozik, 1998; Calfas et al., 1996; Goldstein et al., 1999; Graham-Clarke & Oldenburg, 1994; Marcus et al., 1997; Reid & Morgan, 1979). Follow-up procedures and/or booster phone calls were found in only four of the studies (Calfas et al., 1996; Lewis & Lynch, 1993; Marcus et al., 1997; Reid & Morgan, 1979). Moderate intensity aerobic physical activity was the primary behavioral outcome (Bull &

Jamrozik, 1998; Calfas et al., 1996; Goldstein et al., 1999; Graham-Clarke & Oldenburg, 1994; Lewis & Lynch, 1993; Marcus et al., 1997; Stevens et al., 1998; Swinburn et al., 1998). None of the studies intervened on other types of physical activity, for example, to increase flexibility or strength. General physician advice to increase physical activity was provided (Bull & Jamrozik, 1998; Calfas et al., 1996; Goldstein et al., 1999; Graham-Clarke & Oldenburg, 1994; Logsdon et al., 1989; Lewis & Lynch, 1993; Marcus et al., 1997), and no specific individualized recommendations were created for each patient (Reid & Morgan, 1979; Stevens et al., 1998; Swinburn et al., 1998). Walking was commonly recommended as the mode of activity. Print materials were provided in all of the studies reviewed. Half of the studies utilized a randomized controlled design (Goldstein et al., 1999; Graham-Clarke & Oldenburg, 1994; Reid & Morgan, 1979; Stevens et al., 1998; Swinburn et al., 1998). One study validated a significant intervention effect on moderate physical activity using a Caltrac motion sensor in a sub-sample of participants (Calfas et al., 1996), and only one study reported fitness measures that were in agreement with the physical activity findings (Reid & Morgan, 1979). Four studies used behavioral intervention approaches (Calfas et al., 1996; Graham-Clarke & Oldenburg, 1994; Marcus et al., 1997; Reid & Morgan, 1979), and each of them reported significant effects.

Methodological Issues. Five of the ten studies did not employ a randomized design (Bull & Jamrozik, 1998; Calfas et al., 1996; Logsdon et al., 1989; Lewis & Lynch, 1993; Marcus et al., 1997), and one study disregarded the randomization in the statistical analysis (Lewis & Lynch, 1993); which leads to the questionable validity of the intervention/control comparisons. Follow-up rates were often not reported, making it difficult to judge the quality of the study. When follow-up rates were reported, they were frequently lower than desired, 40%-60% in three studies (Bull & Jamrozik, 1998; Graham-Clarke & Oldenburg, 1994; Stevens et al., 1998) which also threatens the validity of results. Many of the studies did not specify a primary outcome, or used measures without any validity/reliability data, and this is considered a weakness in study design. The definitions of "active" and "sedentary" varied greatly across the studies and details were sometimes missing. For instance, in one study, "regular exercise" was defined as "vigorous physical exercise once a week or more," but duration and intensity were not discussed (Logsdon et al., 1989). All of the studies relied on self-report measures of physical activity, and, except for two studies (Reid & Morgan, 1979; Calfas et al., 1996), objective measures of activity (e.g. Caltrac motion sensor), or of physical fitness tests (e.g. VO_2max measures) were not employed to corroborate the self-report measures.

Intervention Efficacy. Of the five randomized studies, four reported significant increases in physical activity at one or more follow-up measurements (Graham-Clarke & Oldenburg, 1994; Reid & Morgan, 1979; Stevens et al., 1998; Swinburn et al., 1998). Four of the randomized studies included a long-term follow-up assessment (six months to two years after entering the study) (Goldstein et al., 1999; Graham-Clarke & Oldenburg, 1994; Reid & Morgan, 1979; Stevens et al., 1998). Therefore, it can be concluded that changes in physical activity can be initiated by interventions in primary care settings. Long-term results were less promising. Of the three studies that reported outcomes at two time points, analysis of the results indicated that the intervention effects were reduced over time with initially significant effects becoming non-significant (Bull &

Jamrozik, 1998; Graham-Clarke & Oldenburg, 1994; Reid & Morgan, 1979). Of the four randomized studies, only one reported increased levels of physical activity at the long-term assessment (Stevens et al., 1998). However, the physical activity was self-reported, and the specific measure was not stated in the study. This particular study reported the self-assessment of the number of episodes of moderate and vigorous exercise, undertaken for at least 20 minutes, in the last four weeks. The mean number of episodes in the intervention group and control groups were 5.95 and 4.43 respectively. It is apparent that the long-term maintenance of initial exercise behavior change is a crucial consideration for further study. One would not anticipate long-term changes in physical activity without a continuous maintenance program. This speculation is borne out by the decaying effects after the intervention ceases (Simons-Morton, Calfas, Oldenburg & Burton, 1998).

Future Research. In order to determine the long-term efficacy of interventions in primary care, additional randomized trials with high follow-up rates are needed. Outcome measurements should be chosen carefully. Physical activity, as the primary aim of the interventions, should be verified in a high-quality manner sensitive to change. Both physical activity and fitness are important. Objective measures of activity, such as motion sensors, can also be utilized to document self-report assessments. Cardiorespiratory fitness should be measured to document the increase in activity by an objective physiologic measure. An increase in cardiorespiratory fitness is related to the risk reduction of cardiovascular disease (Pate et al., 1995). Recent reviews of the literature on physical activity and health have concluded that moderate-intensity activity has important health benefits, probably aside from increases in cardiorespiratory fitness

(Pate et al., 1995). Therefore, self-reported health status, or health-related quality of life should also be considered when assessing the impact of a physical activity intervention.

Practice Recommendations. Simons-Morton et al., (1998) recently completed a review of interventions in health care settings on physical activity and concluded that effective interventions employed frequent patient contacts, behavioral change approaches (e.g., individualized goal setting and problem solving, self-monitoring, feedback, and reinforcement), supervised exercise programs, provision of equipment (heart monitors, motion sensors etc.), and/or continuing intervention. Interventions of this complexity might be best delivered using a model where physicians provide advice and other members of the health care team provide more in-depth behavioral counseling, physical activity supervision and follow-up. There is accumulating evidence that physical activity counseling in primary care should be considered a minimum standard of care.

Summary. Counseling clients to incorporate increased levels of physical activity into their daily life may have significant health benefits and could decrease health-care spending by reducing the prevalence of sedentary lifestyles (Dunn, Marcus, Kampert, Garci, Kohl & Blair, 1999). Patients report a willingness to follow their doctor's advice, and it might therefore be prudent to develop physical activity interventions in primary health-care locations (Kelly, 1992). Even a relatively small percentage of sedentary people responding positively to counseling by increasing physical activity levels would produce a large absolute number of individuals who adopt and maintain regular activity associated with improved health (Dunn, Anderson, and Jakicic, 1998; Pinto, et al., 1998). However, the frequencies of physical activity counseling and the most effective counseling messages have yet to be determined (Pinto, et al., 1998).

An important consideration of any intervention in this area is the appropriate tailoring of the physical activity regimen to the needs and preferences of the individual client (King et al., 1998). Therefore, a multi-disciplinary collaboration of specialists interested and knowledgeable in the benefits of increased physical activity may be most appropriate and efficacious (Epstein, 1998). The present study will address this concern by designing a physical activity intervention administered by a physical activity consultant in four primary care office settings.

METHODS & PROCEDURE

Study Procedure Overview

A randomized control trial was designed (Refer to Appendix A) to test three primary research objectives. The first primary hypothesis tested if an office-based intervention would increase physical activity among sedentary 40-70 year old adults, when implemented by a physical activity consultant in concert with the participating physicians in four medical clinics. The second primary hypothesis tested if an office-based intervention would increase perceived health-related quality of life among sedentary 40-70 year old adults, when implemented by a physical activity consultant in concert with the participating physicians in four medical clinics. The third primary hypothesis tested if an office-based intervention would increase physical fitness levels among sedentary 40-70 year old adults, when implemented by a physical activity consultant in concert with the participating physicians in four medical clinics.

Secondary objectives of a more exploratory nature were also considered to address the possible changes in self-reported physical activity, perceived health-related quality of life and physical fitness. The TPB was tested to predict changes in self-reported physical activity and physical fitness. SE was tested to predict changes in self-reported physical activity, perceived health-related quality of life, and physical fitness. The Social Provisions Scale (SPS) was tested to predict changes in self-reported physical activity, perceived health-related quality of life, and physical fitness.

During the office visit, the physician determined the potential study participant's present activity level, advised them of the benefits of physical activity (Refer to Appendix B), and provided them with an envelope that contained an information letter (Refer to

Appendix C) concerning the study, and a copy of the Physical Activity Guide created by Active Living Canada (Health Canada, 1998). Those potential study participants considered to be sedentary, and able to participate (Refer to Appendix D), were advised by the physician to become more physically active, and to contact the researcher if they wished to participate in the study, or if they required more information. The physician completed a brief form (Refer to Appendix E) at the time of the office visit, to indicate that the potential participant was physically able to participate in the study. Those patients who considered participation telephoned the physical activity consultant. During the contact phone call, the physical activity consultant answered questions, conducted the Physical Activity Readiness Questionnaire (PAR-Q) (Refer to Appendix F) verbally and obtained verbal consent from those clients wishing to participate in the study. In the event that a participant answered "yes" to any PAR-Q question, a PARmed-X was faxed to the participating clinic to obtain the physician's signature. The PARmed-X form was faxed back to the researcher and kept in the participant's file.

Eligible study participants were then randomly assigned into two groups: control (usual care) and intervention. A random numbers table was used to randomize each condition. The control condition was assigned even numbers and the intervention condition was assigned to odd numbers. As participants called and agreed to be part of the study, their names were added in order to the randomized condition list. Participants were scheduled for a sub-maximal fitness test and completed several questionnaires at baseline. Those participants in the intervention group were also scheduled for a personal interview with the physical activity consultant.

During the interview with the participant, the physical activity consultant followed the problem-solving procedure outlined in The Canadian Physical Activity, Fitness & Lifestyle Appraisal: CSEP's Plan for Healthy Active Living (Canadian Society for Exercise Physiology [CSEP], 1996). Participants assigned to the intervention group also received follow-up booster phone calls at two, four and eight weeks post-randomization. At follow-up (three months post-randomization), all participants received a telephone call from the researcher to schedule appointments to complete the sub-maximal fitness test and repeat psychological measures. Participants that returned to the university to complete the follow-up tests received a thank you card from the researcher.

All participants received a thank you letter for participating in the study, including an indicator of their past and present physical fitness level. The physicians and staff at each clinic also received a thank you letter for cooperating in the study. A summary of the study data was made available to the physicians and discussed for future consideration and recommendations.

Participant Selection

Physicians were provided with a participant selection criteria reminder (Refer to Appendix D) to recruit potential study participants. The researcher also screened potential participants when the contact telephone was made. Potential participant characteristics included:

- adults 40 - 70 years of age, independent in daily living activity
- identified a physician in the clinic as their regular doctor
- currently sedentary (active < 20 minutes, 3X/week in moderate, or vigorous activity)
- stable health
- willing and able to participate
- able to increase physical activity
- willing and able to give informed consent

Physical Activity Consultant

A physical activity consultant was chosen to implement the physical activity intervention. She has obtained the practical experience to prescribe specific, individualized exercise programs to apparently healthy individuals.

Clinical Settings

Seven physicians (general practitioners), in four different medical clinics, interested in the benefits of promoting physical activity within their clinics participated in this study. A half-hour session was arranged with either the clinic manager, or the participating physician to discuss the research program and intervention protocol. The physicians were willing to refer potentially eligible participants to the physical activity consultant for possible recruitment to the study. Three clinics were located in a large city, Edmonton, in northern Alberta. The fourth clinic that participated in the study was located in a small city, St. Albert, in northern Alberta.

Treatment Groups

Intervention. The intervention implemented by the physical activity consultant followed the guidelines set forth in the Canadian Physical Activity, Fitness & Lifestyle Appraisal: CSEP's Plan for Healthy Active Living (CSEP, 1996). During the one-to-one consultation arranged with the participant, a five-step problem-solving approach was adopted. Participants were encouraged to complete several questionnaires and worksheets during the five steps of the interview. These questionnaires and worksheets were referred to as "tools" which helped to build an individualized program for each participant.

At the beginning of the interview, the objective was to develop a comfortable working relationship with the participant. This involved putting the participant at ease, outlining options, informing them of their choices, and describing how the process would unfold. The physical activity consultant tried to create an environment conducive to casual, relaxed conversation.

The next step in the intervention procedure was for the physical activity consultant to familiarize herself with the participant's situation. At this point, the participant was asked to complete several questionnaires/worksheets (Refer to Appendix G) to determine their stage of readiness to adopt physically active behavior, lifestyle needs and activity preferences.

The third step required an integrated analysis of participant feedback, behavioral change information and lifestyle questionnaires. The physical activity consultant collaborated with the participant to generate activity alternatives based on his/her preferences. Once the alternatives were generated, the consultant guided the participant through the next questionnaire/worksheet in the information packet to determine the costs and benefits of exercising.

The fourth step was to develop realistic plans for change. The physical activity consultant used Canada's Physical Activity Guide to make recommendations for change. It was crucial for the participant to cooperate in this process and agree with the strategy. By tailoring the exercise program to match the participant's fitness level and activity preferences, the physical activity consultant helped to ensure successful initial participation experiences and increased self-efficacy.

The objective of the last step was to determine the participant's expectation for follow-up. The step required that the participant understand relapse, and the importance of accountability and social support. The physical activity consultant made booster telephone calls to each intervention participant at two, four, and eight weeks post-randomization. Each intervention participant was offered advice and encouragement during each booster telephone call.

Control (usual care). In this study, usual care was defined as the provision of a copy of the Physical Activity Guide created by Active Living Canada (Health Canada, 1998) and brief physician advice to become more physically active. The Physical Activity Guide described the benefits of physical activity and outlined various strategies to become more physically active. In addition, participants in the control group were offered the one-to-one consultation with the physical activity consultant after the study was completed.

Measures

Physiological Measures. A number of physiological measures were assessed at baseline and three months post-randomization. These measures included pre-exercise heart rate, resting blood pressure, height, weight, and the Balke and Ware Treadmill Test (Balke and Ware, 1959). All testing procedures took place in the Exercise Physiology Lab/Sport Performance Unit at the University of Alberta in the Van Vliet Centre.

In order to achieve standardization and ease of measurement, the participants received information concerning the testing before they arrived for their appointments. Participants were asked to wear comfortable non-restrictive clothing on the day of the test. A pair of walking shoes or running shoes was recommended. Participants were encouraged not to eat for at least two hours before completing the physiological assessment. In addition, the consumption of caffeinated beverages and cigarette smoking was avoided in the two-hour period before the physiological assessment. Lastly, participants were asked not to exercise, or consume alcoholic beverages six hours before the scheduled physiological measurements. Participants were also given directions to the Sport Performance Unit before the day of their appointment. Posters were also placed on the Van Vliet Centre doorways to enable participants to locate the room.

As suggested in the Canadian Physical Activity, Fitness & Lifestyle Appraisal (CSEP, 1996) manual, the health-related fitness assessment followed a sequence in order to prevent high-risk individuals from participating, and to increase safety. Upon arrival for their scheduled appointments, participants were instructed to complete the Physical Activity Readiness Questionnaire (PAR-Q) (Refer to Appendix F) again, unless the researcher had previously received a PARmed-X from their physician. The PAR-Q is a straightforward, but pertinent, questionnaire intended to identify those individuals for whom certain physical activities might be contraindicative. The participants in the study already had their family physician's approval to participate in the study (Refer to Appendix E), and therefore, the second PAR-Q was administered as a simple safety precaution.

Pre-exercise heart rate was assessed once the participants had the opportunity to rest for at least five minutes. Participants sat in a comfortable chair with arm supports and feet flat on the floor. Heart rate was accurately monitored with a cardiotachometer. Participants were asked to place a transmitter with an adjustable strap around their chest next to their skin. A second component, a wrist watch type receiver, received signals from the transmitter to indicate heart rate. Participants with a pre-exercise heart rate of 100 beats-per-minute or more were asked to sit quietly for another five minutes. A second heart rate was taken after that time. Participants were not permitted to complete the remainder of the testing procedure if pre-exercise heart rate was 100 beats-per-minute or more, unless a signed PARmed-X from their physician had been previously obtained.

Immediately following the measurement of pre-exercise heart rate, resting blood pressure was determined while the participant was still seated and resting. A sphygmomanometer (blood pressure cuff) and stethoscope were used to standardize the assessment of resting blood pressure. The blood pressure cuff was applied firmly and smoothly to the participants left arm so that the lower edge of the cuff was two or three centimeters above the antecubital space. The participant's left arm was comfortably supported at an angle of 10 to 45 degrees from the trunk, with the lower edge of the cuff at heart level. The brachial artery was located by palpating the antecubital space.

The cuff was rapidly inflated to a level 20 to 30 mmHg above the radial palpatory pressure. The stethoscope was placed over the brachial artery with a minimal amount of pressure so as not to distort the artery. The diaphragm of the stethoscope was in complete contact with the skin, but not touching the cuff or it's tubing. The pressure in the cuff was released at a rate of approximately two mm-per-second. The systolic pressure was ascertained by the first perception of sound (first Korotkoff sound). When the sounds were fully muffled, the diastolic pressure was determined. Participants were not permitted to complete the remainder of the testing procedure if the resting systolic blood pressure measurement was greater than 144 mmHg, or if the resting diastolic blood pressure was greater than 94 mmHg after two readings, five minutes apart. If a signed

PARmed-X had been previously obtained from their physician, participants were allowed to complete the testing procedure.

The anthropometric measurements of height (cm) and weight (kg) were assessed to calculate body mass index (BMI). To measure height, participants removed footwear and stepped onto the balance beam scale equipped with a vertical evaluation tool. While standing erect with feet together, participants were asked to look straight ahead, stand as tall as possible, and take a deep breath while the measurement was taken. The set square was placed in firm contact with the head (depressing the hair), and a reading taken to the nearest 0.5 cm. Weight was measured on the balance beam scale and recorded to the nearest 0.1 kg. Body mass index was then determined by calculating the ratio of body weight divided by height squared (kg/m^2).

A modified version of the Balke and Ware Treadmill Test (Balke and Ware, 1959) was utilized to indirectly determine aerobic power. This test was chosen to evaluate aerobic power because it was particularly suitable for sedentary adults who may have difficulty jogging (e.g., knee problems). The test was developed in the late 1950's and became recognized as a quick, convenient method of assessing exercise tolerance. The test is normally a continuous multi-stage procedure—a standard speed is maintained throughout the test and the grade is raised 2.5% every two minutes until the participant reaches volitional fatigue. For the purposes of this study, the test was modified so participants would only complete up to and including Stage V of the test. Due to the fact that the population studied was both sedentary and in the 40-70 year old age group, it was deemed unnecessary to have participants exercise until physically exhausted. The laboratory conditions were standardized as much as possible in terms of: temperature—

as close to 18 to 20 °C as possible; adequate ventilation; absence of spectators; and, calibrated treadmills.

The protocol for the Balke and Ware (1959) test followed those suggested by Thoden (1991). To insure safety, each participant was given instructions on how to get on and off the treadmill. Participants were not allowed to hold the handrails of the treadmill. A two minute warm-up period at a pace of 2.0 miles per hour (mph) helped to familiarize participants with the test. Following this orientation, the speed was increased to 3.0 mph and the grade was increased to 2.5% for the next two minutes. This was considered to be Stage I of the test. At the end of the two minutes, the grade was increased to 5.0% for Stage II of the test. This procedure was repeated until the participant had walked for a total of 12 minutes (2 warm-up and 10 test), and the grade had increased to 12.5%. The participant's heart rate was recorded after each two minute segment of the treadmill walking test, but before the incline of the treadmill was increased. When the test was completed, the grade of the treadmill was decreased back to 0%, and participants were encouraged to keep walking for several minutes to lower heart rate.

Self-Reported Measures. Several measures were administered at baseline and three months post-randomization. These included the Godin Leisure Time Exercise Questionnaire (GLTEQ), the MOS 36-Item Short-Form Health Survey (SF-36), the Social Provisions Scale (SPS), and the TPB constructs of attitude, subjective norm, PBC and self-efficacy.

The Godin Leisure Time Exercise Questionnaire (GLTEQ) (Godin & Shephard, 1985) is a self-report, brief three-item measure of regular leisure-time physical activity

(Refer to Appendix H). The questions recounted the weekly frequencies of strenuous, moderate, and light activities. Metabolic equivalents (METS) were assigned to each activity category (strenuous = 9 METS; moderate = 5 METS; and, light = 3 METS), to estimate the total kilocalories per kilogram expended on a weekly basis. The total weekly leisure activity was calculated in arbitrary units by summing the products of the separate components.

A questionnaire was developed to assess the TPB constructs and was based on previous research in the exercise and physical activity domain (Refer to Appendix I).

Attitude was assessed by both direct and indirect methods. Participants reported their attitude toward increasing their daily physical activity on nine 7-point semantic differential scales (Godin et al., 1993). Each of the nine scales appeared following the statement, "In your opinion, to participate regularly (3 to 5 times per week) in at least 30 minutes of moderate physical activity during your free time within the next three months would be . . . ." The bipolar adjectives were foolish/wise, worthless/worthwhile, bad/good, useless/useful, harmful/beneficial, dull/interesting, unpleasant/pleasant, exhausting/invigorating and boring/fun. The scores for nine scales were averaged and ranged from 1 to 7.

Subjective normative beliefs were measured using the narrow definition of the construct. First, four normative beliefs were measured on a 7-point bipolar scale, with unlikely (-3) and likely (+3) at opposite poles. People were asked to indicate to what extent they believed that each of the listed referents "think they should participate regularly (3 to 5 times per week) in moderate physical activity for at least 30 minutes during their free time during the next three months." The scores for the four scales were re-coded from 1 to 7, and then averaged.

Perceived behavioral control was operationalized according to the three methods discussed previously. Where, the first method measured perceived PBC directly, according to the traditional manner. The second method, self-efficacy, assessed the participant's personal control over internal resources, such as confidence, skills or ability. The third method, barriers, addressed the actual control over resources and external environmental constraints.

Concerning the first operationalization of PBC, participants were asked to answer the following questions on a 9-point bipolar scale with the following adjectives extremely likely/extremely unlikely, complete control/very little control, and easy/difficult respectively. "If I wanted to, I could easily accumulate at least 30 minutes of moderate physical activity 3 to 5 times per week during my free time within the next three months?" "How much control do you have over whether you accumulate at least 30 minutes of moderate physical activity 3 to 5 times per week during your free time within the next three months?" "For me to accumulate at least 30 minutes of moderate physical activity 3 to 5 times per week during my free time within the next three months will be." The scores for the three scales were summed and ranged from 3 to 27.

Pertaining to the second operationalization of perceived behavioral control, self-efficacy, participants were asked to determine their perceived confidence level with anchors of 0% (no confidence) and 100% (completely confident) with respect to the following questions: "How confident are you that you could pace yourself to avoid over-exertion?" "How confident are you that you could perform all the required movements?"

"How confident are you that you could follow directions from an instructor?" "How confident are you that you could check how hard your activity is making you work?" These four questions targeted the individual's task efficacy, or confidence in their ability to perform the required task. The scores for the task efficacy were averaged and ranged from 0 to 100. The remaining four questions tapped the individual's scheduling efficacy, or confidence in their ability to cope with adopting a new behavior. The last four questions were: "How confident are you that you could exercise 3 times per week for the next 3 months?" "How confident are you that you could overcome obstacles that prevent you from participating regularly?" "How confident are you that you could make up times you missed?" "How confident are you that you could exercise regularly, no matter what?" The scores for the scheduling efficacy were averaged and ranged from 0 to 100.

Barriers, the third operationalization of perceived behavioral control, was measured by assessing participants' perceptions of the frequency of occurrence of factors that facilitated or inhibited increasing daily physical activity. Participants were asked to rate eleven barriers (too tired, work too much, bad day at work, feel ill, don't feel like it, family commitments, have no time, too lazy/lack energy, health conditions, have bad back, lack self-discipline) with respect to the frequency of occurrence (frequently/sometimes/never). Secondly, participants then rated the likelihood of overcoming each barrier (barriers efficacy) on a 10-point bi-polar scale anchored by "not at all confident" and "completely confident." The scales were averaged and ranged from 1 to 10.

The MOS 36-Item Short-Form Health Survey (SF-36) (Refer to Appendix J) is comprised of eight multi-item scales measuring each of the following health concepts: 1) physical functioning; 2) role limitation because of physical health problems; 3) bodily pain; 4) social functioning; 5) general mental health (psychological distress and psychological well-being); 6) role limitation because of emotional problems; 7) vitality (energy/fatigue); and 8) general health perceptions (Ware and Sherbourne, 1992). The SF-36 permitted the calculation of the eight scales that can be presented as a profile of health status concepts. The scores for the eight sub-scales of the SF-36 ranged from 0 to 100. In addition, two aggregate summary measures—physical component summary (PCS) and mental component summary (MCS) were also calculated. The physical component summary represents limitations in self-care, physical, social, and role activities, bodily pain, energy levels, well-being, and self-rated health. The mental component summary represents the presence, or absence of psychological distress, affect, social/role limitations due to emotional distress, and self-rated health (Ware, Kosinski, Bayliss, McHorney, Rogers, and Raczek, 1995).

The multi-item Social Provisions Scale (SPS) was developed by Cutrona and Russell (1987), and is based on Weiss's six dimensions of interpersonal support (Refer to Appendix K). The scale is a 24-item instrument that assesses the degree to which social relationships are fulfilling each of the six social provisions described by Weiss (1974). Each of the six dimensions was addressed by four items—two positively and two negatively worded statements (DiTommaso & Spinner, 1997). The scores for each sub-scale ranged from 4 to 16. Russell and Cutrona's (1984) examination of an elderly sample of approximately 100 community-living elderly showed reliability coefficients of more than 0.70 for each of the six social provisions subscales.

Primary Research Objectives

H_1: There are no differences between the mean levels of self-reported physical activity levels among persons randomized to the control and intervention groups of the clinical trial at three months post-randomization.

H_2: There are no differences between the mean health-related quality of life scores among persons randomized to the control and intervention groups of the clinical trial at three months post-randomization.

H_3: There are no differences between the mean physical fitness (heart rate) measures among persons randomized to the control and intervention groups of the clinical trial at three months post-randomization.

Analytical Approach. An Analysis of Variance (ANOVA) was conducted to determine if participants from each referral clinic were similar on all variables at time 1. Tukey's Least Significant Difference (LSD) post hoc tests were used to determine the source of any significant effects at time 1. An Analysis of Variance (ANOVA) was conducted to determine if females and males were similar on all variables at time 1. Tukey's Least Significant Difference (LSD) post hoc tests were used to determine the source of any significant effects at time 1. An Analysis of Variance (ANOVA) was conducted to determine if participants in each treatment condition (control and intervention) were similar on all variables at time 1. Tukey's Least Significant Difference (LSD) post hoc tests were used to determine the source of any significant effects at time 1. ANOVAS with one between subject's factor (intervention condition, control condition) and one within subject's factor (time 1, time 2) with repeated measures on the second factor were performed to determine whether there were any changes in variable mean scores at

time 2.

Secondary Research Objectives

The secondary research objectives of this study were to determine if the theoretical variables would account for changes in the dependent variables (self-reported physical activity, health-related quality of life, and physical fitness). First, the TPB, SE, and SPS were used to predict changes in self-reported physical activity. Next, SE and SPS were used to predict changes in health-related quality of life. Finally, the TPB, SE, and SPS were used to predict changes in physical fitness.

Analytical Approach. Pearson correlation coefficients were conducted to examine the possible relationships among the theory variables and dependent variables of interest. When significant correlations were found, Regression Analyses were performed to examine the hypotheses that the theory variables would predict changes in the dependent variables in this study.

Ethical Considerations

Ethics approval for the present study was sought from the Health Research Ethics Board. Confidentiality was maintained throughout the study. The data collected were locked in a filing cabinet in a lab at the University of Alberta. Information gathered during the individualized consultations from the study participants in the intervention group was also locked in a filing cabinet in a lab at the University of Alberta. Only the physical activity consultant had access to this information. Participants were informed of their right to ask questions, or to drop out of the study at any time without consequence. A signed consent form was collected from participants before the study began (Refer to Appendix L). A copy of this agreement was forwarded to all study participants.

RESULTS

Sample Characteristics

A total of 57 participants were recruited to this study. There were 28 participants in the intervention condition (20 females and 8 males) and 29 participants in the control condition (18 females and 11 males). Age of participants ranged from 38 to 66 years (mean = 50.77, SD = 7.21). Body Mass Index (BMI) ranged from 22.19 to 47.91 (mean = 32.87, SD = 5.76). Participants in both treatment conditions were similar to each other on all study variables (Refer to Appendix O).

A total of 43 participants completed testing at time 2. Of the 14 participants that did not complete testing at time 2, one was injured, three had recently been diagnosed with a chronic condition, three did not want to be tested because they knew that had not become more physically active, and seven were unable to find the time to make an appointment. There were 22 participants in the intervention condition (16 females and 6 males) and 21 participants in the control condition (13 females and 8 males). Age of participants ranged from 41 to 66 years (mean = 51.07, SD = 7.18). Body Mass Index (BMI) ranged from 22.82 to 49.30 (mean = 32.87, SD = 5.64).

Descriptive Statistics

The data were aggregrated to create the sub-scale scores for the TPB, SE, HRQOL, and SPS constructs. Internal consistency reliability coefficients were calculated for each of the subsequent sub-scales. Table 1 presents the means, standard deviations and internal consistency reliability coefficient values for the TPB and SE constructs, for both treatment conditions (control and intervention), at both time points. The scores for attitude and subjective norm ranged from 1 to 7. The scores for perceived behavioral control ranged from 3 to 27. The scores for barrier efficacy ranged from 1 to 10. The scores for task efficacy and scheduling efficacy ranged from 0 to 100.

Table 1

Descriptive statistics of Theory of Planned Behavior measures

	Reliability Coefficients		Intervention Condition		Control Condition	
Variable	Time 1 α	Time 2 α	Time 1 Mean (SD) n = 57	Time 2 Mean (SD) n = 43	Time 1 Mean (SD) n = 57	Time 2 Mean (SD) n = 43
Attitude	.82	.82	6.06 (0.74)	6.04 (0.65)	6.17 (0.59)	6.20 (0.62)
Subjective Norm	.85	.55	6.36 (1.22)	6.49 (0.67)	6.69 (0.46)	6.24 (0.55)
Perceived Behavioral Control	.86	.79	19.64 (5.45)	20.86 (4.41)	21.07 (4.75)	20.78 (3.83)
Barrier Efficacy	.91	.85	7.31 (2.06)	7.78 (1.46)	7.60 (1.36)	7.58 (1.26)
Task Efficacy	.81	.89	78.44 (17.45)	76.91 (16.74)	79.71 (15.40)	79.17 (10.33)
Scheduling Efficacy	.93	.96	74.69 (25.77)	75.71 (22.38)	78.34 (13.60)	76.18 (15.22)
Physical Activity Intention (METs)	--	--	36.93 (23.75)	34.61 (24.81)	36.48 (19.56)	37.60 (26.46)
Current Physical Activity (METs)	--	--	14.04 (15.83)	28.09 (23.51)	21.66 (20.23)	43.05 (26.81)

Table 2 presents the means, standard deviations and internal consistency reliability coefficient values for the HRQOL constructs, for both treatment conditions (control and intervention), at both time points. The scores for the eight sub-scales of the SF-36 ranged from 0 to 100.

Table 2

Descriptive statistics of Health-Related Quality of Life measures

	Reliability Coefficients		Intervention Condition		Control Condition	
Variable	Time 1 α	Time 2 α	Time 1 Mean (SD) n = 57	Time 2 Mean (SD) n = 43	Time 1 Mean (SD) n = 57	Time 2 Mean (SD) n = 43
Physical Functioning	.90	.91	80.89 (19.96)	86.67 (11.55)	78.45 (23.34)	82.50 (22.31)
Role Limitation Physical	.82	.83	67.86 (41.31)	70.24 (37.60)	75.86 (28.73)	79.17 (32.37)
Bodily Pain	.86	.88	68.36 (22.68)	68.48 (24.65)	72.66 (20.00)	78.56 (13.90)
General Health	.76	.75	61.39 (20.28)	76.67 (14.01)	70.24 (17.92)	79.44 (11.05)
Vitality	.86	.85	48.93 (20.06)	55.48 (19.23)	51.90 (20.46)	62.78 (18.00)
Social Functioning	.54	.92	73.21 (22.49)	76.79 (30.18)	79.31 (19.84)	86.11 (14.15)
Role Limitation Emotional	.84	.84	63.10 (41.91)	85.71 (32.61)	67.82 (41.29)	77.78 (36.16)
Mental Health	.77	.86	70.14 (17.47)	80.95 (16.73)	75.31 (14.31)	78.22 (15.41)
Physical Component Summary	--	--	47.14 (9.43)	47.80 (7.41)	48.31 (8.93)	50.53 (7.30)
Mental Component Summary	--	--	44.96 (12.25)	51.22 (11.25)	47.75 (11.08)	51.04 (10.63)

Table 3 presents the means, standard deviations and internal consistency reliability coefficient values for the SPS constructs, for both treatment conditions (control and intervention), at both time points. The scores for each sub-scale ranged from 0 to 16.

Table 3

Descriptive statistics of Social Provisions Scale measures

	Reliability Coefficients		Intervention Condition		Control Condition	
Variable	Time 1 α	Time 2 α	Time 1 Mean (SD) n = 57	Time 2 Mean (SD) n = 43	Time 1 Mean (SD) n = 57	Time 2 Mean (SD) n = 43
Guidance	.70	.85	12.00 (2.04)	13.05 (2.33)	12.16 (2.06)	12.39 (1.61)
Reassurance of Worth	.67	.74	10.96 (1.88)	11.38 (2.64)	11.55 (2.01)	11.44 (1.69)
Social Integration	.81	.86	11.29 (1.86)	11.67 (2.76)	12.10 (2.53)	11.78 (1.96)
Attachment	.84	.86	10.75 (2.53)	11.71 (2.83)	11.10 (2.92)	10.89 (2.68)
Nurturance	.76	.82	9.25 (2.22)	9.19 (2.75)	9.19 (2.53)	8.61 (2.06)
Reliable Alliance	.65	.74	11.64 (2.20)	12.29 (2.55)	11.52 (2.05)	12.06 (1.80)

Table 4 also lists the means and standard deviations of the physiological measures for both treatment conditions (control and intervention), at both time points.

Table 4

Descriptive statistics of physiological measures

	Intervention Condition		Control Condition	
Variable	Time 1 Mean (SD) n = 56	Time 2 Mean (SD) n = 41	Time 1 Mean (SD) n = 56	Time 2 Mean (SD) n = 41
Systolic Blood Pressure (mm Hg)	126.39 (12.27)	123.83 (11.33)	127.55 (12.48)	125.30 (12.25)
Diastolic Blood Pressure (mm Hg)	86.57 (10.35)	84.83 (10.84)	84.41 (8.13)	87.70 (9.59)
Pre-Exercise Heart Rate (BPM; 0 minutes)	81.00 (9.18)	76.00 (8.47)	76.93 (10.74)	73.30 (9.36)
Exercise Heart Rate 1 (BPM; 2 minutes)	101.64 (13.25)	101.09 (10.36)	100.29 (14.11)	94.89 (11.76)
Exercise Heart Rate 2 (BPM; 4 minutes)	115.46 (14.27)	113.00 (12.55)	111.57 (14.66)	107.32 (15.71)
Exercise Heart Rate 3 (BPM; 6 minutes)	125.21 (15.13)	120.14 (13.85)	120.86 (14.65)	116.47 (17.54)
Exercise Heart Rate 4 (BPM; 8 minutes)	136.14 (16.18)	130.05 (13.65)	131.59 (17.27)	122.83 (16.80)
Exercise Heart Rate 5 (BPM; 10 minutes)	148.39 (15.61)	139.76 (15.21)	141.76 (17.14)	132.89 (19.76)
Exercise Heart Rate 6 (BPM; 12 minutes)	156.50 (16.37)	148.05 (13.48)	153.08 (19.39)	144.33 (21.44)

Primary Research Objectives

Differences at Time 1

An Analysis of Variance (ANOVA) was conducted to determine if participants from each referral clinic were similar on all variables at time 1. Tukey's Least Significant Difference (LSD) post hoc tests were used to determine the source of any significant effects at time 1. Table 5 indicates only the variables with significant differences from each referral clinic.

Table 5

Significant effects at time 1 among referral clinics

Variable	Mean	SD	df	F	Sig.
Resting blood pressure (systolic)			3, 53	6.41	p < .01
Family Physician Associates	119.33	10.07			
Grandin Medical Clinic	129.67	7.09			
Grey Nuns Medical Clinic	134.55	12.32			
Dr. Ausford Medical Clinic	121.76	9.83			
Resting blood pressure (diastolic)			3, 53	4.57	p < .01
Family Physician Associates	82.67	4.16			
Grandin Medical Clinic	85.33	7.57			
Grey Nuns Medical Clinic	90.64	10.04			
Dr. Ausford Medical Clinic	81.86	7.46			
Strenuous activity intention (METs)			3, 53	4.57	p < .01
Family Physician Associates	3.33	3.06			
Grandin Medical Clinic	0.00	0.00			
Grey Nuns Medical Clinic	0.50	1.22			
Dr. Ausford Medical Clinic	1.34	1.45			

An Analysis of Variance (ANOVA) was conducted to determine if females and males were similar on all variables. Tukey's Least Significant Difference (LSD) post hoc tests were used to determine the source of any significant effects at time 1. Table 6 indicates the variables with significant differences between females and males.

Table 6

Significant effects at time 1 between females and males

Variable	df	F	Sig.
Role Limitation (physical)	1, 55	12.18	p < .01
Bodily Pain	1, 55	10.05	p < .01

An Analysis of Variance (ANOVA) was conducted to determine if participants in each treatment condition (control and intervention) were similar on all variables. Tukey's Least Significant Difference (LSD) post hoc tests were used to determine the source of any significant effects at time 1. There were no significant differences between participants in the control and intervention conditions on time 1 variables (Refer to Appendix O).

Changes from Time 1 to Time 2

ANOVAS with one between subjects factor (intervention condition, control condition) and one within subject's factor (time 1, time 2) with repeated measures on the second factor were performed to determine whether there were any changes in variable mean scores. There was no main effect of treatment condition. In addition, no condition by time interaction was found. However, a main effect was found for time on several physical activity, health-related quality of life and physiological measures. Table 7 indicates the significant univariate effects of time.

Table 7

Tests of within-subject contrasts over time

Variable	df	F	Sig.	Partial Eta Squared	Observed Power
Physical Activity					
METs (Metabolic Equivalents)	1, 40	11.13	$p < .01$	.22	.90
Health-Related Quality of Life					
General Health	1, 41	12.17	$p < .01$	.23	.93
Role Limitation (emotional)	1, 41	11.53	$p < .01$	.22	.91
Mental Health	1, 41	12.22	$p < .01$	.23	.93
Mental Component Summary	1, 41	13.58	$p < .01$	.25	.95
Physiological					
Pre-exercise heart rate	1, 41	10.64	$p < .01$	.21	.89
Exercise heart rate stage 4	1, 38	12.45	$p < .01$	.25	.93
Exercise heart rate stage 5	1, 37	22.16	$p < .01$	.38	1.00
Exercise heart rate stage 6	1, 35	25.00	$p < .01$	.42	1.00

The participants from each treatment condition (control and intervention) were not significantly different from each other, but changed equally over time with respect to their physical activity levels, health-related quality of life indicators and physiological measures (heart rate). Participants from both conditions indicated that they had become significantly more physically active during the three-month study period as indicated by an increase in self-reported MET (metabolic equivalent) scores. There was also a significant improvement in general health perceptions, role limitation (emotional), mental health and the mental component summary for participants in both treatment conditions. Lastly, participants in both treatment conditions also made significant gains in fitness over the three-month study period, evidenced by decreased heart rates on the sub-maximal fitness test. Specifically, pre-exercise heart rate and exercise heart rates during the last half of the fitness test decreased significantly. Therefore, the data from both conditions were collapsed to complete further analyses. The remainder of the results will be presented according to the analyses for each question.

Secondary Research Objectives

Predicted Changes in Self-Reported Physical Activity

Relationships between Theory of Planned Behavior constructs and self-reported physical activity. Pearson correlation coefficients (Table 8) were conducted to examine the possible relationships among the time 1 TPB constructs and time 1 self-reported physical activity. As suggested by the TPB, attitude was correlated to subjective norm and perceived behavioral control. Perceived behavioral control was also correlated to subjective norm. Physical activity intention was strongly correlated to current physical activity, which is also suggested by the TPB.

Table 8

Bivariate correlations from time 1 TPB constructs and time 1 physical activity

Variable	1	2	3	4
1. Attitude				
2. Subjective Norm	.38**			
3. Perceived Behavioral Control	.53**	.30*		
4. Physical Activity Intention	.18	-.14	.24	
5. Current Physical Activity	.09	.03	.24	.64**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found, and therefore, a Regression Analysis was performed to examine the hypothesis that the TPB would predict future physical activity intention. A regression analysis using the time 1 TPB constructs as predictors (independent variables), and time 1 physical activity intention as a dependent variable was conducted. Table 9 shows that the TPB constructs did not predict physical activity intention.

Table 9

Regression analysis examining the influence of time 1TPB constructs on time 1 physical activity intention

Variable	Total R^2_{adj}	β	t	p
Physical Activity Intention				
Perceived Behavioral Control		.24	1.54	.13
Attitude		.16	1.00	.32
Subjective Norm		-.27	-1.89	.06
Total R^2_{adj}	.07			

Note: (F (3, 52) = 2.43, p < .08)

A second regression analysis using the time 1 TPB constructs, including current physical activity as predictors (independent variables), and time 1 physical activity intention as a dependent variable was conducted (Table 10). Current physical activity was the only significant predictor in the model.

Table 10

Regression analysis examining the influence of time 1 TPB constructs including current physical activity on time 1 physical activity intention

Variable	Total R^2_{adj}	ΔR^2	β	t	p
Physical Activity Intention					
Model 1 (F (1, 54) = 37.48, p < .01)					
Current Physical Activity		.41	.64	6.12	< .01
Total R^2_{adj}	.40				
Model 2 (F (4, 51) = 11.69, p < .01)					
Current Physical Activity			.62	5.89	< .01
Perceived Behavioral Control			.07	.56	.58
Attitude			.19	4.51	.14
Subjective Norm		.07	-.25	-2.24	.03
Total R^2_{adj}	.44				

Pearson correlation coefficients (Table 11) were conducted to examine the possible relationships among the time 1 TPB constructs and time 2 current physical activity. Perceived behavioral control and physical activity intention were correlated to time 2 current physical activity, which is suggested by the TPB.

Table 11

Bivariate correlations from time 1 TPB constructs and time 2 current physical activity

Variable	1	2	3	4
1. Attitude				
2. Subjective Norm	.38**			
3. Perceived Behavioral Control	.53**	.30*		
4. Physical Activity Intention	.18	-.14	.24	
5. Time 2 Current Physical Activity	.20	-.08	.35*	.52**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found, and therefore, a Regression Analysis was performed to examine the hypothesis that the TPB would predict future current physical activity. A regression analysis using the time 1 TPB constructs and physical activity intention as predictors (independent variables), and time 2 current physical activity as a dependent variable was conducted. Table 12 shows that physical activity intention was a significant predictor of time 2 current physical activity.

Table 12

Regression analysis examining the influence of time 1 TPB constructs including physical activity intention on time 2 current physical activity

Variable	Total R^2_{adj}	ΔR^2	β	t	p
Time 2 Current Physical Activity					
Model 1 (F (1, 39) = 14.30, p < .01)					
Physical Activity Intention		.27	.51	3.78	< .01
Total R^2_{adj}	.25				
Model 2 (F (4, 36) = 4.47, p < .01)					
Physical Activity Intention			.49	3.27	< .01
Perceived Behavioral Control			.29	1.81	.08
Attitude			-.11	-.65	.52
Subjective Norm		.06	.02	.13	.90
Total R^2_{adj}	.26				

Pearson correlation coefficients (Table 13) were conducted to examine the possible relationships among the time 2 TPB constructs and time 2 self-reported physical activity intention. Perceived behavioral control was correlated to attitude, physical activity intention and current physical activity. Physical activity intention was strongly correlated to current physical activity, which is also suggested by the TPB.

Table 13

Bivariate correlations from time 2 TPB constructs and time 2 current physical activity

Variable	1	2	3	4
1. Attitude				
2. Subjective Norm	.00			
3. Perceived Behavioral Control	.48**	.17		
4. Physical Activity Intention	.07	.19	.45**	
5. Current Physical Activity	.22	.14	.61**	.92**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found, and therefore, a Regression Analysis was performed to examine the hypothesis that the TPB would predict future physical activity intention. A regression analysis using the time 2 TPB constructs including time 2 current physical activity as predictors (independent variables), and time 2 physical activity intention as a dependent variable was conducted. Table 14 shows that current physical activity was the only predictor of physical activity intention.

Table 14

Regression analysis examining the influence of time 2 TPB constructs including time 2 current physical activity on time 2 physical activity intention

Variable	Total R^2_{adj}	ΔR^2	β	t	p
Time 2 Physical Activity Intention					
Model 1 (F (1, 40) = 198.51, p < .01)					
Current Physical Activity		.83	.91	14.09	< .01
Total R^2_{adj}	.83				
Model 2 (F (4, 37) = 55.05, p < .01)					
Current Physical Activity			.94	11.95	< .01
Perceived Behavioral Control			-.06	-.60	.55
Attitude			-.18	-.37	.72
Subjective Norm		.00	.07	.14	.89
Total R^2_{adj}	.84				

Relationships between Self-Efficacy constructs and self-reported physical activity. Pearson correlation coefficients (Table 15) were conducted to examine the possible relationships among the time 1 SE constructs and time 1 self-reported physical activity intention. The three types of self-efficacy were correlated to each other. Physical activity intention was correlated to task efficacy and scheduling efficacy.

Table 15

Bivariate correlations from time 1 SE constructs and time 1 physical activity

Variable	1	2	3
1. Barrier Efficacy			
2. Task Efficacy	.50**		
3. Scheduling Efficacy	.79**	.53**	
4. Physical Activity Intention	.23	.31*	.26*

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found, and therefore, a Regression Analysis was performed to examine the hypothesis that SE would predict future physical activity intention. A regression analysis using the time 1 SE constructs as predictors (independent variables), and time 1 physical activity intention as a dependent variable was conducted. Table 16 shows that no significant predictor of physical activity intention was found.

Table 16

Regression analysis examining the influence of time 1 SE constructs on time 1 physical activity intention

Variable	Total R^2_{adj}	β	t	p
Physical Activity Intention				
Barrier Efficacy		.01	.06	.96
Task Efficacy		.23	1.51	.14
Scheduling Efficacy		.13	.60	.55
Total R^2_{adj}	.06			

Note: (F (3, 53) = 2.15, p < .11)

Pearson correlation coefficients (Table 17) were conducted to examine the possible relationships among the time 1 SE constructs and time 2 current physical activity. No significant correlations were found between time 1 SE constructs and time 2 current physical activity.

Table 17

Bivariate correlations from time 1 SE constructs and time 2 current physical activity

Variable	1	2	3
1. Barrier Efficacy			
2. Task Efficacy	.50**		
3. Scheduling Efficacy	.79**	.53**	
4. Time 2 Current Physical Activity	.21	.14	.25

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Pearson correlation coefficients (Table 18) were conducted to examine the possible relationships among the time 2 SE constructs and time 2 physical activity intention. The three types of self-efficacy were correlated to each other at time 2. Scheduling efficacy was also correlated to physical activity intention.

Table 18

Bivariate correlations from time 2 SE constructs and time 2 physical activity intention

Variable	1	2	3
1. Barrier Efficacy			
2. Task Efficacy	.36*		
3. Scheduling Efficacy	.68**	.64**	
4. Physical Activity Intention	.15	.19	.31*

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found, and therefore, a Regression Analysis was performed to examine the hypothesis that SE would predict future physical activity intention. A regression analysis using the time 2 SE constructs as predictors (independent variables), and time 2 physical activity intention as a dependent variable was conducted. Table 19 shows that the SE constructs did not predict physical activity intention.

Table 19

Regression analysis examining the influence of time 2 SE constructs on time 2 physical activity intention

Variable	Total R^2_{adj}	β	t	p
Physical Activity Intention				
Barrier Efficacy		-.12	-.56	.58
Task Efficacy		-.02	-.09	.93
Scheduling Efficacy		.40	1.59	.12
Total R^2_{adj}	.03			

Note: (F (3, 39) = 1.50, p < .23)

Relationships between Social Provisions Scale constructs and self-reported physical activity. Pearson correlation coefficients (Table 20) were conducted to examine the possible relationships among the time 1 SPS constructs and time 1 physical activity intention. The six sub-scales of the SPS were correlated to each other, with the exception of guidance and nurturance. Physical activity intention was also correlated to social integration and attachment.

Table 20

Bivariate correlations from time 1 SPS constructs and time 1 physical activity intention

Variable	1	2	3	4	5	6
1. Guidance						
2. Reassurance of Worth	.52**					
3. Social Integration	.46**	.60**				
4. Attachment	.72**	.64**	.72**			
5. Nurturance	-.00	.36**	.32*	.33*		
6. Reliable Alliance	.65**	.54**	.65**	.76**	.27*	
7. Physical Activity Intention	.08	.10	.35**	.27*	.12	.15

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Pearson correlation coefficients (Table 21) were conducted to examine the possible relationships among the time 1 SPS constructs and time 2 current physical activity. Current physical activity was correlated to guidance and social integration.

Table 21

Bivariate correlations from time 1 SPS constructs and time 2 current physical activity

Variable	1	2	3	4	5	6
1. Guidance						
2. Reassurance of Worth	.52**					
3. Social Integration	.46**	.60**				
4. Attachment	.72**	.65**	.73**			
5. Nurturance	-.00	.36**	.32*	.33*		
6. Reliable Alliance	.66**	.56**	.67**	.76**	.27*	
7. Current Physical Activity	.31*	.12	.40*	.24	-.70	.22

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Pearson correlation coefficients (Table 22) were conducted to examine the possible relationships among the time 2 SPS constructs and time 2 physical activity intention. The six sub-scales of the SPS were correlated to each other with the exception of nurturance, which was only correlated to social integration. Physical activity intention was correlated to guidance.

Table 22

Bivariate correlations from time 2 SPS constructs and time 2 physical activity intention

Variable	1	2	3	4	5	6
1. Guidance						
2. Reassurance of Worth	.54**					
3. Social Integration	.73**	.71**				
4. Attachment	.81**	.63**	.80**			
5. Nurturance	.26	.15	.37*	.25		
6. Reliable Alliance	.83**	.61**	.79**	.78**	.21	
7. Physical Activity Intention	.37*	.16	.30	.16	.12	.25

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Predicted Changes in Health-Related Quality of Life

Relationships between Self-Efficacy constructs and health-related quality of life.

Pearson correlation coefficients (Table 23) were conducted to examine the possible relationships among the time 1 SE constructs and the time 2 HRQOL measures which changed significantly over time (Table 7). The HRQOL indicators were correlated to each other, with the exception of general health and role limitation (emotional). The mental component summary was correlated to barrier, task and scheduling efficacy. Barrier efficacy was also correlated to mental health. Task efficacy was also correlated to role limitation (emotional).

Table 23

Bivariate correlations from time 1 SE constructs and time 2 health-related quality of life

Variable	1	2	3	4	5	6
1. Barrier Efficacy						
2. Task Efficacy	.50**					
3. Scheduling Efficacy	.79**	.53**				
4. General Health	.15	-.05	.16			
5. Role Limitation (emotional)	.22	.33*	.25	.07		
6. Mental Health	.39*	.25	.29	.49**	.62**	
7. Mental Component Summary	.43**	.38*	.39*	.32*	.78**	.89**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found, and therefore, Regression Analyses were performed to examine the hypothesis that SE would predict changes in health-related quality of life. A regression analysis using the time 1 SE constructs as predictors (independent variables), and time 2 general health as a dependent variable was conducted. Table 24 shows that SE did not predict general health.

Table 24

Regression analysis examining the influence of time 1 SE constructs on the time 2 general health sub-scale of the SF-36

Variable	Total R^2_{adj}	β	t	p
Time 2 General Health				
Barrier Efficacy		.11	.46	.65
Task Efficacy		-.26	-1.27	.21
Scheduling Efficacy		.23	.86	.39
Total R^2_{adj}	-.01			

Note: (F (3, 39) = .91, p < .44)

A regression analysis using the time 1 SE constructs as predictors (independent variables), and time 2 role limitation (emotional) as a dependent variable was conducted. Table 25 shows that SE did not predict role limitation (emotional).

Table 25

Regression analysis examining the influence of time 1 SE constructs on the time 2 role limitation (emotional) sub-scale of the SF-36

Variable	Total R^2_{adj}	β	t	p
Time 2 Role Limitation (Emotional)				
Barrier Efficacy		.02	.07	.94
Task Efficacy		.28	1.40	.17
Scheduling Efficacy		.06	.23	.82
Total R^2_{adj}	.04			

Note: $(F(3, 39) = 1.59, p < .21)$

A regression analysis using the time 1 SE constructs as predictors (independent variables), and time 2 mental health as a dependent variable was conducted. Table 26 shows that SE did not predict time 2 mental health.

Table 26

Regression analysis examining the influence of time 1 Self-Efficacy sub-scales on the time 2 mental health sub-scale of the SF-36

Variable	Total R^2_{adj}	β	t	p
Time 2 Mental Health				
Barrier Efficacy		.39	1.64	.11
Task Efficacy		.08	.39	.70
Scheduling Efficacy		-.06	-.22	.83
Total R^2_{adj}	.09			

Note: $(F(3, 39) = 2.32, p < .09)$

A regression analysis using the time 1 SE constructs as predictors (independent variables), and time 2 mental component summary as a dependent variable was conducted. Table 27 shows that SE did predict the time 2 mental component summary.

Table 27

Regression analysis examining the influence of time 1 SE constructs on the time 2 mental component summary sub-scale of the SF-36

Variable	Total R^2_{adj}	β	t	p
Time 2 Mental Component Summary				
Barrier Efficacy		.31	1.37	.18
Task Efficacy		.19	1.04	.31
Scheduling Efficacy		.02	.09	.93
Total R^2_{adj}	.16			

Note: ($F(3, 39) = 3.57, p < .02$)

Pearson correlation coefficients (Table 28) were conducted to examine the possible relationships among the time 1 SE constructs and the change in general health, role limitation (emotional), mental health, and mental component summary. Change in mental health was correlated to change in general health, change in role limitation (emotional), and change in the mental component summary. The change in the mental component summary was also correlated to change in role limitation (emotional). No significant correlations were found between the time 1 SE constructs and the change in HRQOL constructs.

Table 28

Bivariate correlations from time 1 SE constructs and change in health-related quality of life

Variable	1	2	3	4	5	6
1. Barrier Efficacy						
2. Task Efficacy	.50**					
3. Scheduling Efficacy	.79**	.53**				
4. Δ General Health	.11	-.17	.10			
5. Δ Role Limitation (emotional)	.10	.12	.15	.12		
6. Δ Mental Health	.23	-.02	.13	.44**	.51**	
7. Δ Mental Component Summary	.22	.11	.19	.26	.77**	.79**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Relationships between Social Provisions Scale constructs and health-related quality of life. Pearson correlation coefficients (Table 29) were conducted to examine the possible relationships among the time 1 SPS constructs and the time 2 HRQOL measures which changed significantly over time (Table 7). Reassurance of worth was correlated to role limitation (emotional), mental health, and the mental component summary. The mental component summary was also correlated to social integration.

Pearson correlation coefficients (Table 30) were conducted to examine the possible relationships among the time 1 SPS constructs and the change in general health, role limitation (emotional), mental health, and mental component summary. Nurturance was negatively correlated to change in general health.

Table 29

Bivariate correlations from time 1 Social Provisions Scale scores and time 2 health-related quality of life

Variable	1	2	3	4	5	6	7	8	9
1. Guidance									
2. Reassurance of Worth	.52**								
3. Social Integration	.46**	.60**							
4. Attachment	.72**	.64**	.72**						
5. Nurturance	-.00	36**	.32*	.33*					
6. Reliable Alliance	.65**	.54**	.65**	.76**	.27*				
7. General Health	.14	.03	.03	.03	-.19	-.00			
8. Role Limitation (emotional)	-.04	.33*	.25	.06	.08	.13	.07		
9. Mental Health	.12	.34*	.27	.20	-.12	.16	.49*	.62**	
10. Mental Component Summary	-.05	.34*	.31*	.20	.01	.11	.32*	.78**	.89**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 30

Bivariate correlations from time 1 Social Provisions Scale scores and change in health-related quality of life

Variable	1	2	3	4	5	6	7	8	9
1. Guidance									
2. Reassurance of Worth	.52**								
3. Social Integration	.46**	.60**							
4. Attachment	.72**	.64**	.72**						
5. Nurturance	-.00	36**	.32*	.33*					
6. Reliable Alliance	.65**	.54**	.65**	.76**	.27*				
7. Δ General Health	.07	-.13	-.16	-.17	-.43*	-.10			
8. Δ Role Limitation (emotional)	-.07	.23	.15	-.10	-.01	.09	.12		
9. Δ Mental Health	.11	.13	.17	-.00	-.23	.10	.44*	.51**	
10. Δ Mental Component Summary	-.02	.19	.24	-.02	-.05	.03	.26	.77**	.79**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Predicted Changes in Physical Fitness (heart rate)

Relationships between Theory of Planned Behavior constructs and fitness measures (heart rate). Pearson correlation coefficients (Table 31) were conducted to examine the possible relationships among time 1 TPB constructs and time 2 fitness measures. As expected, pre-exercise heart rate and the heart rate measure for each stage of the treadmill test were strongly correlated to each other. Pre-exercise heart rate was also positively correlated to attitude.

Table 31

Bivariate correlations from time 1 Theory of Planned Behavior scores and time 2 fitness measures (heart rate)

Variable	1	2	3	4	5	6	7	8	9	10
1. Physical Activity Intention										
2. Attitude	.18									
3. Subjective Norm	-.14	.38**								
4. Perceived Behavioral Control	.24	.53**	.30*							
5. Pre-exercise heart rate	.07	.37*	-.05	.13						
6. Exercise heart rate stage 1	-.07	.10	.16	-.00	.53**					
7. Exercise heart rate stage 2	-.00	.29	.16	.08	.50**	.89**				
8. Exercise heart rate stage 3	-.05	.18	.15	.04	.46**	.84**	.95**			
9. Exercise heart rate stage 4	.05	.28	.06	.04	.49**	.78**	.91**	.96**		
10. Exercise heart rate stage 5	.04	.23	.04	.03	.40*	.71**	.86**	.93**	.97**	
11. Exercise heart rate stage 6	.06	.17	.01	-.02	.39*	.66**	.79*	.88**	.94**	.97**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found, and therefore, a Regression Analysis was performed to examine the hypothesis that the TPB would predict future pre-exercise heart rate. A regression analysis using time 1 TPB constructs as predictors (independent variables), and time 2 pre-exercise heart rate as the dependent variable was conducted. Table 32 shows that attitude was a significant predictor of pre-exercise heart rate.

Table 32

Regression analysis examining the influence of time 1 TPB constructs on time 2 pre-exercise heart rate

Variable	Total R^2_{adj}	β	t	p
Pre-exercise Heart Rate				
Physical Activity Intention		-.07	-.42	.68
Perceived Behavioral Control		-.08	-.46	.65
Attitude		.44	2.40	.02
Subjective Norm		-.10	-.67	.50
Total R^2_{adj}	.06			

Note: $(F(4, 37) = 1.68, p < .18)$

Pearson correlation coefficients (Table 33) were conducted to examine the possible relationships among the time 1 TPB constructs and the physical fitness measures which changed significantly over time (Table 7). The change in pre-exercise heart rate was positively correlated to current physical activity and change in exercise heart rate at stage 4. The change in exercise heart rate at stage 4, stage 5 and stage 6 were all correlated to each other.

Table 33

Bivariate correlations from time 1 Theory of Planned Behavior scores and the change in fitness measures (heart rate)

Variable	1	2	3	4	5	6	7	8
1. Attitude								
2. Subjective Norm	.38**							
3. Perceived Behavioral Control	.53**	.30*						
4. Physical Activity Intention	.18	-.14	.24					
5. Current Physical Activity	.09	.03	.24	.64**				
6. Δ Pre-exercise heart rate	.14	-.20	-.01	.19	.39*			
7. Δ Exercise heart rate stage 4	.02	-.26	.06	-.07	.24	.40*		
8. Δ Exercise heart rate stage 5	.14	-.03	.25	-.04	.18	.25	.82**	
9. Δ Exercise heart rate stage 6	.02	-.01	.18	-.14	.02	.20	.72**	.87**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found, and therefore, a Regression Analysis was performed to examine the hypothesis that the TPB would predict the change in pre-exercise heart rate. A regression analysis using time 1 TPB constructs as the predictor variables (independent variables), and the change in pre-exercise heart rate as the dependent variable was conducted. Table 34 shows that current physical activity was the only predictor of change in pre-exercise heart rate.

Table 34

Regression analysis examining the influence of TPB on the change in pre-exercise heart rate

Variable	Total R^2_{adj}	ΔR^2	β	t	p
Δ Pre-Exercise Heart Rate					
Model 1 (F (1, 40) = 7.20, $p < .01$)					
Current Physical Activity		.15	.39	2.68	< .01
Total R^2_{adj}	.13				
Model 2 (F (5, 36) = 2.35, $p < .06$)					
Current Physical Activity			.52	2.77	< .01
Physical Activity Intention			-.23	-1.12	.27
Perceived Behavioral Control			.30	1.63	.11
Subjective Norm			-.21	-1.40	.17
Attitude		.09	-.19	-1.07	.29
Total R^2_{adj}	.14				

Relationships between Self-Efficacy constructs and fitness measures (heart rate). Pearson correlation coefficients (Table 35) were conducted to examine the possible relationships among time 1 SE constructs and time 2 fitness measures. No significant correlations were found between time 1 SE constructs and time 2 fitness measures (heart rate).

Table 35

Bivariate correlations from time 1 Self-Efficacy scores and time 2 fitness measures (heart rate)

Variable	1	2	3	4	5	6	7	8	9
1. Barrier Efficacy									
2. Task Efficacy	.50**								
3. Scheduling Efficacy	.79**	.53**							
4. Pre-exercise heart rate	.11	.21	.29						
5. Exercise heart rate stage 1	.06	-.09	.11	.53**					
6. Exercise heart rate stage 2	.28	.04	.30	.50**	.89**				
7. Exercise heart rate stage 3	.21	-.07	.19	.45**	.84**	.95**			
8. Exercise heart rate stage 4	.20	-.02	.14	.49**	.78**	.91**	.96**		
9. Exercise heart rate stage 5	.11	-.04	.03	.39*	.71**	.85**	.93**	.97**	
10. Exercise heart rate stage 6	.09	-.08	.01	.38*	.66**	.78**	.88**	.94**	.97**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Pearson correlation coefficients (Table 36) were conducted to examine the possible relationships among time 1 SE constructs and the physical fitness measures which changed significantly over time (Table 7). Task efficacy was correlated to the change in exercise heart rate at stage 5 and stage 6.

Table 36

Bivariate correlations from time 1 SE constructs and the change in fitness measures (heart rate)

Variable	1	2	3	4	5	6
1. Barrier Efficacy						
2. Task Efficacy	.50**					
3. Scheduling Efficacy	.79**	.53**				
4. Δ Pre-exercise heart rate	.00	.23	.10			
5. Δ Exercise heart rate stage 4	-.02	.27	.09	.40*		
6. Δ Exercise heart rate stage 5	.01	.40*	.15	.25	.82**	
7. Δ Exercise heart rate stage 6	-.06	.46**	.07	.20	.72**	.87**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found, and therefore, Regression Analyses were performed to examine the hypothesis that SE would predict the change in exercise heart rate at stage 5 and stage 6 of the treadmill test. A regression analysis using time 1SE constructs as predictors (independent variables), and the change in exercise heart at stage 5 as a dependent variable was conducted. Table 37 shows that SE did not predict the change in exercise heart rate at stage 5 of the treadmill test.

Table 37

Regression analysis examining the influence of time 1 SE constructs on the change in heart rate at stage 5 of the treadmill test

Variable	Total R^{2adj}	β	t	p
Δ Exercise Heart Rate Stage 5				
Barrier Efficacy		-.08	-.30	.77
Task Efficacy		.17	.77	.45
Scheduling Efficacy		.12	.44	.66
Total R^{2adj}	-.03			

Note: (F (3, 35) = 0.59, p < .63)

A regression analysis using time 1 SE constructs as predictors (independent variables), and the change in exercise heart at stage 6 as a dependent variable was conducted. Table 38 shows that SE did not predict the change in exercise heart rate at stage 6 of the treadmill test.

Table 38

Regression analysis examining the influence of time 1 SE constructs on the change in heart rate at stage 6 of the treadmill test

Variable	Total R^{2adj}	β	t	p
Δ Exercise Heart Rate Stage 6				
Barrier Efficacy		.02	.09	.93
Task Efficacy		.15	.74	.46
Scheduling Efficacy		-.04	-.15	.88
Total R^{2adj}	-.07			

Note: (F (3, 33) = 0.22, p < .89)

Relationships between Social Provisions Scale constructs and fitness measures (heart rate). Pearson correlation coefficients (Table 39) were conducted to examine the possible relationships among the time 1 SPS constructs and time 2 fitness measures. Exercise heart rate stage 6 was positively correlated to guidance and attachment.

Pearson correlation coefficients (Table 40) were conducted to examine the possible relationships among time 1 SPS constructs and the physical fitness measures which changed significantly over time (Table 7). Nurturance was positively correlated to the change in exercise heart rate stage 6 of the treadmill test.

Table 39

Bivariate correlations from time 1 Social Provisions sub-scale scores and time 2 fitness measures (heart rate)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Guidance												
2. Reassurance of Worth	.52**											
3. Social Integration	.46**	.60**										
4. Attachment	.72**	.64**	.72**									
5. Nurturance	-.00	.36**	.32*	.33*								
6. Reliable Alliance	.65**	.54**	.65**	.76**	.27*							
7. Pre-exercise hr	.10	-.04	-.13	.19	.02	.08						
8. Exercise heart rate 1	.09	-.16	-.06	.05	-.19	.13	.53**					
9. Exercise heart rate 2	.17	-.04	.06	.21	-.06	.27	.50**	.89**				
10. Exercise heart rate 3	.13	-.11	.00	.16	-.17	.18	.45**	.84**	.95**			
11. Exercise heart rate 4	.22	-.04	.02	.27	-.21	.21	.49**	.78**	.91**	.96**		
12. Exercise heart rate 5	.27	-.00	.09	.29	-.13	.19	.39*	.71**	.85**	.93**	.97**	
13. Exercise heart rate 6	.43**	.08	.11	.36*	-.13	.30	.38*	.66**	.78**	.88**	.94**	.97**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 40

Bivariate correlations from time 1 Social Provisions sub-scale scores and the change in fitness measures (heart rate)

Variable	1	2	3	4	5	6	7	8	9
1. Guidance									
2. Reassurance of Worth	.52**								
3. Social Integration	.46**	.60**							
4. Attachment	.72**	.64**	.72**						
5. Nurturance	-.00	.36**	.32*	.33*					
6. Reliable Alliance	.65**	.54**	.65**	.76**	.27*				
7. Δ Pre-exercise heart rate	-.00	.20	.20	.03	.01	-.07			
8. Δ Exercise heart rate stage 4	-.13	.20	.25	.05	.03	-.03	.40*		
9. Δ Exercise heart rate stage 5	-.20	.23	.30	.03	.18	.03	.25	.82**	
10. Δ Exercise heart rate stage 6	-.18	.30	.31	.06	.36*	-.07	.20	.72**	.87*

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

DISCUSSION

The main purposes of this study were to determine if a physical activity intervention in a medical clinic would increase the health-related quality of life and self-reported physical activity levels of sedentary adults when implemented by a physical activity consultant in concert with clinic physicians. Furthermore, physical fitness was also considered in order to provide objective physiological measures of possible changes in physical activity behavior.

The following discussion will interpret the study results in a temporal fashion. First, the differences among the participants relating to referral clinic, sex, and treatment condition will be examined at time 1. The next section will consider the changes found for physical activity, health-related quality of life and physical fitness from time 1 to time 2. A third section will interpret the changes in physical activity, health-related quality of life and physical fitness with respect to the TPB, SE and SPS. Finally, a brief summary will discuss the key findings of this study.

Primary Research Objectives

Differences at Time 1

Referral Clinic. Significant differences in the resting systolic and diastolic blood pressure were found among the participants from each referral clinic at time 1. The participants from clinic #3 (n = 22) appeared to have significantly higher resting blood pressure than the other three clinics. Perhaps the physicians in this particular clinic referred more people with elevated blood pressure because increased physical activity might be beneficial. Strenuous activity intention (METs) was also found to be significantly different among the participants from each referral clinic at time 1. Clinic

#1, however, included only three participants, two of who both intended to participate in strenuous activities. Clinic #2 had only three participants, none of whom intended to participate in strenuous activities. Therefore, although there might be some consistent differences between clinics, the low number of participants from Clinic #1 and Clinic #2 are unlikely to influence the mean of all participants.

Sex. Significant differences in role limitation (physical) and bodily pain were found between female and male participants at time 1. The female participants in the study indicated that they perceived more role limitation due to physical constraints and more bodily pain than the male participants. However, the number of female and male participants was evenly distributed in both treatment conditions. Although there might be some consistent differences between the females and males in this study, this is unlikely to influence the between groups' comparisons.

Treatment condition. No significant differences in any of the study variables were found among participants in each treatment condition (control and intervention) at time 1. This suggests that the results were not confounded by any of the study variables.

Changes from Time 1 to Time 2

It appears that the intervention employed in this study had no significant effects on participants randomly assigned to that condition. Participants in both treatment conditions (control and intervention) were similar with respect to their self-reported physical activity levels, perceived health-related quality of life, and their physical fitness measures. Furthermore, there was no treatment condition by time interaction found. However, a main effect for time was found on several variables. Participants who completed the testing at time 2 were significantly more physically active, reported higher health-related quality of life scores, and achieved increased fitness levels.

Physical Activity. Participants in both treatment conditions (control and intervention) were significantly more physically active (METs) at time 2. Metabolic equivalents (METS) were assigned to each activity category (strenuous = 9 METS; moderate = 5 METS; and, light = 3 METS). Total weekly leisure activity was calculated in arbitrary units called metabolic equivalents (METs), by summing the products of the separate components. The participants in the control condition had a mean score of 21.66 (20.23) METs at time 1, and 43.05 (26.81) METs at time 2. The participants in the intervention condition had a mean score of 14.04 (15.83) METs at time 1, and 28.09 (23.51) METs at time 2. The participants in the control condition reported more leisure time physical activity than participants in the intervention condition at both time points, although this difference was not significant. Participants in both treatment conditions (control and intervention) reported approximately twice as much leisure time physical activity at the end of the three-month study.

It is possible that the participants in this study were already highly motivated to become more physically active. Each participant was given an information package, including Canada's Physical Activity Guide (Health Canada, 1998), advice from his or her family physician to become more physically active, and then made a conscious decision to become more physically active before calling the researcher. In essence, the participants used the study as an impetus, or means to embark on a more physically active lifestyle.

The intervention that was employed during the individual consultations followed the problem-solving procedure outlined in The Canadian Physical Activity, Fitness & Lifestyle Appraisal: CSEP's Plan for Healthy Active Living (Canadian Society for Exercise Physiology [CSEP], 1996). This particular toolkit was chosen because it was developed by the Canadian Society for Exercise Physiology, and is currently used in practice throughout Canada by certified physical activity consultants. The "tools" and worksheets contained in the toolkit did not specifically target the theory constructs addressed in this study.

It was hypothesized that the extra support and guidance provided by the physical activity consultant, and not the "tools" per se, would enable participants in the intervention condition to become more physically active when compared to the participants in the control condition. The physical activity consultant met individually with participants in the intervention condition to discuss possible activity choices, how to overcome barriers and obstacles that might impede progress, and to establish realistic goals for the three-month study. The physical activity consultant also spoke with participants in the intervention condition at two-, four-, and eight-weeks after the individual consultation to offer encouragement, answer questions, and assist with goal modifications if required.

Perhaps this procedure is not effectual when participants are already motivated to become more physically active. The "tools" and worksheets contained in The Canadian Physical Activity, Fitness & Lifestyle Appraisal: CSEP's Plan for Healthy Active Living (CSEP, 1996) were designed to motivate participants to change their behavior. The participants in this study had already decided to become physically active when they called and agreed to take part in the study. Therefore, these findings suggest that the intervention as it was structured, might be more appropriate for people that were given physician advice to become more physically active, but did not make the telephone call to participate in the study.

The two groups in this study were named control and intervention condition to differentiate which group received more support and guidance from the physical activity consultant. However, as the study was structured, the participants in the control condition also received extra information and attention during the study that might not have occurred during a "regular visit" to the family physician. The participants in the control condition received advice from the family physician to become more physically active, a copy of Canada's Physical Activity Guide, and a free fitness assessment at the university. The physician advice, the activity guide, and the fitness assessment would not necessarily be considered "usual care". These factors combined with the commitment to participate in the study may have been motivating to the participants in the control condition. Therefore, as the study was designed, participants in the control condition also received a "treatment" that enabled them to become more physically active during the three-month study period.

Health-Related Quality of Life. Participants in both treatment conditions (control and intervention) significantly improved their perceptions of general health, role limitation (emotional), mental health, and mental component summary scores at time 2. Participants perceived enhanced mental and emotional well-being at the end of the three-month study. General health was the only physical domain sub-scale where significant changes were found. No significant changes were found in the remaining three physical domain sub-scales. These findings suggest that a ceiling effect might have occurred. The physical functioning, role limitation (physical), and bodily pain scores were consistent with previous research (Ware, Kosinski, Bayliss, Mchorney, Rogers, and Raczek, 1995). The participants in this study were middle-aged (51 years), and may be too young to be experiencing difficulties functioning in their routine daily activities.

Physical Fitness. Participants in both treatment conditions (control and intervention) significantly increased physical fitness at time 2. More specifically, pre-exercise heart rate, exercise heart rate stage 4, exercise heart rate stage 5, and exercise heart rate stage 6 all decreased when tested at time 2. These decreases in heart rate are evidence of increased physical fitness because a slower beating heart is more efficient, and requires less oxygen than a faster beating heart working at the same cardiac output (Ekblom, Astrand, Saltin, Stenberg and Wallstrom, 1968; Levy, Cerqueira, Harp, Johannessen, Abrass, Schwartz et al., 1998; Milesis, Pollock, Bah, Ayres, Ward and Linnerud, 1976; Pollock, 1973; Saltin, Hartley, Kilbom, and Astrand, 1969). A decrease in heart rate during sub-maximal exercise is possibly the most consistent adaptation associated with increased physical activity. In addition, this decrease in heart rate is most apparent when physically inactive participants are compared to highly trained athletes (Ekblom et al., 1968; Levy et al., 1998; Milesis et al., 1976; Pollock, 1973; Saltin et al., 1969). The participants in this study did not report being physically active at time 1, and therefore, by becoming more physically active, were able to achieve significant gains in fitness over the three-month study period.

Secondary Research Objectives

Influence of Theoretical Variables on Physical Activity

Theory of Planned Behavior. The TPB is a pragmatic social-cognitive model for analyzing exercise behavior and determining why people are physically active (Ajzen and Driver, 1993; Brenes et al., 1998; Courneya and McCauley, 1995; Godin et al., 1993; Kerner and Grossman, 1998; Kimiecik, 1992; Madden et al., 1992; Michels and Kugler, 1998; Terry and O'Leary, 1995). The TPB suggests that there are relationships among a person's attitude toward a behavior, subjective normative beliefs, perceived behavioral control to behavioral intention and behavior (Ajzen and Madden, 1986). Therefore, we would expect to find correlations among these variables. Each construct in the model (attitude, subjective norm, perceived behavioral control) can also be examined as a predictor of behavioral intention by analyzing the cognitive responses to statements in questionnaires completed by participants (Gatch and Kendzierski, 1990; Godin et al., 1993). However, a person's behavioral intention is the most important determinant of behavior. For example, a person with strong intentions to become physically active would be more likely to act on those intentions.

The first set of regression analyses was conducted to predict physical activity intention at time 1 from the time 1 TPB constructs. As suggested by the TPB, attitude, subjective norm and perceived behavioral control were all correlated at time 1. Physical activity intention was also strongly correlated to current physical activity, which is also consistent with the TPB. The time 1 TPB constructs did not predict physical activity intention at time 1 as the TPB proposes.

However, time 1 current physical activity was a significant predictor of physical activity intention at time 1 when included in the regression. What this finding suggests is that a participant's physical activity level before the study (past behavior) was the strongest predictor of how they intended to behave during the study (future behavior). Subjective norm also made a significant contribution to the model, which is consistent with previous research (Brenes et al., 1998; Millstein, 1996). This finding suggests that participants believed that referents (significant other/partner/spouse, adult children, friend, family physician) thought they should participate regularly in moderate physical activity. The participants in this study were advised by their family physician to become more physically active, and therefore, this finding is not unreasonable.

A second set of prospective regression analyses was conducted to predict physical activity at time 2 from the time 1 TPB constructs. Time 2 physical activity was correlated to perceived behavioral control and physical activity intention, consistent with TPB postulates (Verplanken et al., 1998). However, the only significant predictor in the model was physical activity intention. This set of relationships is likely due to the "motivated state" of these participants. Their physical activity intention and physical activity behavior were quite congruent (r = .52**). Also, there was little variance in physical activity intention and physical activity behavior across the sample. In this case, it is reasonable that time 1 physical activity intention should be the strongest predictor of physical activity behavior at time 2, as postulated by TPB.

The last set of regression analyses was conducted to predict physical activity intention at time 2 from the time 2 TPB constructs. Perceived behavioral control was correlated to attitude, physical activity intention and current physical activity, which is proposed by the TPB (Verplanken et al., 1998). Physical activity intention was also strongly correlated to current physical activity, which is consistent with the TPB. Time 2 current physical activity was the strongest predictor of time 2 physical activity intention.

What these findings suggest is that a participant's physical activity during the study (past behavior) was the strongest predictor of how they intended to behave after the study (future behavior). As stated previously, this set of relationships is likely due to the "motivated state" of these participants. Their physical activity intention and physical activity behavior were quite congruent (r = .92**). Also, there was little variance in physical activity intention and physical activity behavior across the sample. In this case, it is reasonable that time 2 physical activity behavior should be the strongest predictor of physical activity intention at time 2.

Self-Efficacy. Self-efficacy is characterized by a person's control over internal resources, such as confidence, skills or ability (Bandura, 1986). However, self-efficacy is also confidence that is situation specific. For example, a person may feel confident singing in the bathtub, but may not feel confident singing/performing for others. Previous research has indicated that people intend to participate in activities for which they feel they are skillful (Conner and Armitage, 1998). However, it is possible, for example, that a person might feel she/he has control over her/his physical activity behavior and is self-efficacious for performing it, but is unable to overcome difficulties such as work obligations and time commitments. For the purposes of this study, SE was measured according to Rodgers and Sullivan (2001), who assessed three types of self-efficacy. The three types assessed in this study were barrier, task and scheduling efficacy. Barrier efficacy is concerned with a person's confidence to overcome obstacles such feeling too tired, or lacking self-discipline. Task efficacy is influenced by a person's confidence in their ability to follow directions, or pace themselves during a workout. Scheduling efficacy is affected by a person's confidence to exercise regularly, or make up missed sessions. These variables all involve a person's confidence and belief in their abilities in the physical activity domain, and therefore, we would expect these variables to be strongly correlated to each other (Rodgers and Sullivan, 2001).

The first set of regression analyses was conducted to predict physical activity intention at time 1 from the time 1 SE constructs. Physical activity intention was correlated to task efficacy and scheduling efficacy. However, the time 1 SE constructs did not predict physical activity intention at time 1.

These findings are not consistent with previous research (Conner and Armitage, 1998). Previous research has indicated that SE was able to distinguish between groups defined in terms of physical activity, so that more active people had higher SE (McCauley and Courneya, 1993; McCauley, Courneya, Rudolph and Lox, 1994; Rodgers and Gauvin, 1998; Rodgers and Sullivan, 2001). The participants in this study reported that they were not physically active and many were inexperienced exercisers. However, their barrier, task, and scheduling efficacy scores were all very high, indicating that perhaps this "inexperienced" sample was not able to distinguish between task and scheduling efficacy and that they were very confident they could be physically active. There were also very high correlations between barrier, task and scheduling efficacy. Therefore, much of the variance was spread out across the efficacy types, and did not sit with any one specific predictor of physical activity intention at time 1.

The final set of regression analyses was conducted to predict physical activity intention at time 2 from the time 2 SE constructs. Barrier efficacy, task efficacy and scheduling efficacy were all correlated at time 2. Physical activity intention was correlated to scheduling efficacy. However, the time 2 SE constructs did not predict physical activity intention at time 2. In general, because the self-efficacy variables are so highly correlated, they are probably not accounting for unique variance in physical activity intention. This is somewhat consistent with previous work that has suggested that the nature and strength of the relationships between the types of self-efficacy change as a function of activity participation (Rodgers and Sullivan, 2001; Rodgers, Blanchard, Bell, Wilson, and Gesell, in press).

Social Provisions Scale. Social support involves the provision of encouraging or helping behaviour, whereas subjective norm is concerned with the perceived social pressure to perform or not perform a behaviour (Courneya and McAuley, 1996). Social support was originally conceptualized as a one-dimensional construct, but has since been broken down to six component functions referred to as the "provisions of social relationships" (Weiss, 1974). Therefore, we would expect the six sub-scales of the SPS to be correlated (Cutrona and Russell, 1987).

Pearson correlation coefficients were conducted to explore the possible relationships between physical activity intention and the time 1 SPS constructs. The six sub-scales were highly correlated to each other with the exception of guidance and nurturance, which were not correlated. Physical activity intention was correlated to social integration and attachment.

A second set of Pearson correlation coefficients was conducted to consider the possible relationships between current physical activity at time 2 and the time 1 SPS constructs. Current physical activity was correlated to guidance and social integration.

The high correlations among the SPS constructs suggest that perhaps these variables are not much different from each other. Correlations of this magnitude might suggest that some of these SPS constructs may be measuring the same construct (Licht, 1995). These findings become problematic because the larger the correlations between predictors, the more likely it is that they will share the same variance in the criterion, or dependent variable.

The last set of Pearson correlation coefficients was conducted to examine the possible relationships between physical activity intention at time 2 from the time 2 SPS constructs. The six sub-scales were correlated to each other, with the exception of nurturance, which was only correlated to social integration. Physical activity intention was correlated to guidance.

Influence of Theoretical Variables on Health-Related Quality of Life

Self-Efficacy. Regression analyses were conducted to predict HRQOL at time 2 from the time 1 SE constructs. The HRQOL indicators were correlated to each other, with the exception of general health and role limitation (emotional). The mental component summary was correlated to barrier efficacy, task efficacy and scheduling efficacy. The mental health sub-scale was correlated to barrier efficacy. Role limitation (emotional) was correlated to task efficacy. The time 1 SE constructs did predict the mental component summary at time 2.

These findings suggest a possible relationship among social-cognitive variables resulting in higher perceptions of global mental health. Apparently, those participants who felt confident that they could overcome obstacles to their physical activity program at time 1 were more likely to perceive improved global mental health at time 2. This in turn suggests that increasing SE might have positive effects on perceptions of mental health. In essence, the perception of increased mental health was associated with higher efficacy scores, suggesting some independent influence of the psychological constructs from those offered by physical activity involvement. However, previous research has indicated that those participants who are more physically active also have higher efficacy scores (Rodgers and Sullivan, 2001; Rodgers et al., in press), and therefore, the psychological benefits of a physically active lifestyle cannot be discounted.

In order to determine whether the time 1 SE constructs were related to HRQOL changes over time, exploratory correlations were performed. The change in HRQOL measures were correlated to each other with the exception of general health, which was only correlated to mental health. No significant correlations were found between the time 1 SE constructs and the HRQOL changes over time.

Social Provisions Scale. Pearson correlation coefficients were conducted to explore the possible relationships HRQOL at time 2 and the time 1 SPS constructs. Reassurance of worth was correlated to role limitation (emotional), mental health and the mental component summary. The mental component summary was also correlated to social integration.

A second set of Pearson correlation coefficients was conducted to consider the possible relationships between the change in HRQOL and the time 1 SPS constructs.

Nurturance was negatively correlated to change in general health and the only time 1 SPS construct correlated to the HRQOL measures.

Influence of Theoretical Variables on Physical Fitness (heart rate)

Heart rate measures are objective indicators of physical fitness, and are reflective of each participant's physical activity level. Participants walked on a treadmill at a speed of 3.0 m.p.h. for 12 minutes. The grade on the treadmill started at 0.0%, and increased every two minutes by 2.5% until the test was completed at a grade of 12.5%. Each progressive stage of the treadmill test increased the workload placed on the heart, which responded by beating more quickly. Therefore, during the treadmill test, participants' heart rates increased progressively. This relationship between increased workload and increased heart rate suggests that heart rate at each progressive workload would be highly positively correlated.

Theory of Planned Behavior. The first set of regression analyses was conducted to predict physical fitness (heart rate) at time 2 from the time 1 TPB constructs. Pre-exercise heart rate and the heart rate measure for each stage of the treadmill test were strongly correlated to each other at time 2. In addition, attitude was positively correlated to pre-exercise heart rate. Time 1 attitude was a significant predictor of pre-exercise heart rate at time 2.

These findings are noteworthy because of the positive relationship between time 1 attitude and pre-exercise heart rate at time 2. In general, the mean scores for attitude were quite high, indicating that participants held positive attitudes toward physical activity. One interpretation of this finding is that the participants, who had more positive attitudes about physical activity at time 1, also had higher heart rates at time 2. It is possible that these participants might have had the most to gain from becoming physically active, and therefore, felt strongly about the benefits of physical activity.

A second set of regression analyses was conducted to predict the change in physical fitness (heart rate) from time 1 TPB constructs. Change in heart rate was calculated by subtracting the time 1 heart rate from the time 2 heart rate before, and at each stage of the treadmill test. Therefore, negative scores are indicative of decreased heart rate, and presumed increased physical fitness. The change in exercise heart rate at stage 4, stage 5 and stage 6 were all correlated to each other. The change in pre-exercise heart rate was positively correlated to current physical activity and the change in exercise heart rate at stage 4. Current physical activity at time 1 was a significant predictor of the change in pre-exercise heart rate.

This finding is also notable because of the positive relationship between time 1 current physical activity and the change in pre-exercise heart. In general, the mean scores for current physical activity were quite low, indicating that participants were not active at time 1. One interpretation of this finding is that the participants, who were more physically active at time 1, changed the least with the respect to physical fitness. Another interpretation is that the participants, who were less physically active at time 1, changed the most with respect to physical fitness. These results are consistent with previous research that has indicated that a decrease in heart rate is most conspicuous when physically inactive participants are compared to highly trained athletes (Ekblom et al., 1968; Levy et al., 1998; Milesis et al., 1976; Pollock, 1973; Saltin et al., 1969). In addition, a lower heart rate is a consistent adaptation associated with increased physical activity (Ekblom et al., 1968; Levy et al., 1998; Milesis et al., 1976; Pollock, 1973; Saltin et al., 1969). It is possible that the participants who were least active at time 1 would have the most to gain by becoming more physically active. These findings are consistent with previous research (McMurdo and Burnett, 1992), and therefore, it is quite likely that the participants in this study that were the least physically active at time 1, made the greatest physical fitness gains during the three-month study.

Self-Efficacy. The first set of regression analyses was conducted to predict the change in physical fitness (heart rate) from time 1 SE constructs. Task efficacy was positively correlated to the change in exercise heart rate at stage 5 and stage 6 of the treadmill test. In essence, those participants who reported high task efficacy at time 1 achieved less physical fitness gains at the end of the three-month study. The time 1 SE constructs did not predict the change in exercise heart rate at stage 5 and stage 6 of the treadmill test.

These findings are partially consistent with previous research. Previous research has indicated that more physically active people, and therefore, more physically fit, had higher SE (McCauley and Courneya, 1993; McCauley, Courneya, Rudolph and Lox, 1994; Rodgers and Gauvin, 1998; Rodgers and Sullivan, 2001). The participants in this study reported that they were not physically active and many were novice exercisers. However, their barrier, task, and scheduling efficacy scores were all very high, indicating that perhaps this "inexperienced" sample over estimated their confidence to overcome obstacles at time 1. There were also very tight correlations between barrier, task and scheduling efficacy. Therefore, much of the variance was spread out across the efficacy types, and did not sit with any one specific predictor of the change in physical fitness as represented by the change in exercise heart rate at stage 5 and stage 6 of the treadmill test.

Social Provisions Scale. Pearson correlation coefficients were conducted to explore the possible relationships between physical fitness (heart rate) at time 2 from the time 1 SPS constructs. Time 1 guidance and attachment were positively correlated to exercise heart at stage 6 at time 2.

A second set of Pearson correlation coefficients was conducted to consider the possible relationships between the change in physical fitness (heart rate) from the time 1 SPS constructs. Nurturance was positively correlated to the change in exercise heart rate stage 6 of the treadmill test.

Summary of Key Findings

Primary Research Objectives

The primary objectives of this research were to determine if a medical office-based intervention would increase self-reported physical activity, perceived health-related quality of life, and physical fitness. There were no significant differences found between participants in each treatment condition at the end of the three-month study. The intervention in this study did not appear to be successful.

Secondary Research Objectives

Physical activity intention was the strongest predictor of physical activity behavior. Current physical activity was the strongest predictor of future physical activity intention. These findings seem to suggest that the participants in this study were highly motivated to become more physically active. The TPB constructs did not predict future intention to become physically active, which might indicate some peculiarities to this sample. First, within the sample, the participants intended to do, and were doing fairly different amounts of physical activity. The scores for current physical activity and physical activity intention were quite varied across the sample. Secondly, there was a high correlation between current physical activity and physical activity intention. Essentially, there was great consistency between the activity level participants reported, and how active they intended to be in the future. This suggests that the participants in this study were really quite stable in terms of the match between current physical activity and physical activity intention.

The findings in this study seem to suggest possible relationships amongst the physical activity, health-related quality of life and physical fitness variables. Physical activity programs enhance a person's quality of life essentially by influencing the situational and contextual variables of affect, perceived stress, physical health, and life satisfaction (Berger and Mott, 2001). Physical activity has been associated with positive self-esteem and self-concept, reduction of psychological and physiological stress indicators, and therefore plays a primary role in health-related quality of life (Argyle, 1999; Berger and McInman, 1993; Berger, 1996). Laforge et al., (1999) reported a positive relationship between physical activity and the perception of enhanced health. Similar findings in a 32-week study indicated that the participants that were most physically active were also significantly less depressed, and improved significantly in perceived life satisfaction and health (McMurdo and Burnett, 1992). Further analysis indicated that engaging in physical activity, and not the intention to exercise, was primarily responsible for this association. In addition, Huang et al., (1998) found a steep inverse gradient of functional limitation across both physical fitness and physical activity categories. These findings suggest that the participants that were more physically active also perceived less functional limitation in their daily routines.

Moderate physical activity consistently seems to be associated with enhanced mental health (Berger and Mott, 2000; Berger and Owen, 1988; Steptoe, Kearsley and Walters, 1993). In general, the participants in this study chose to include walking as their main physical activity. Previous research has found that brisk-walking may be conducive to mood alteration (Berger and Owen, 1998; Jin, 1992; Thayer, 1987). Furthermore, walking briskly for as little as 10 minutes was found to reduce tension and tiredness, and that these psychological changes were evident up to two hours after an activity session (Thayer, 1987).

People that are physically active have a tendency to be more confident about their physical capabilities and have more positive self-concepts (Butkl and Rudolph, 1997; Grimm et al., 1997). As a result of these psychological changes, exercisers have healthier psychological resources for coping with stressful situations (Berger and Mott, 2001). The findings from this study suggest that a relationship exists between self-efficacy and global mental health. It is possible that by becoming more physically active, participants became more confident and were able to cope with the stresses of daily life more effectively. There is a general agreement that regular physical activity can be affiliated with enhanced subjective well-being, or a sense of "feeling better" (Berger and Mott, 2001). However, it should be noted that this relationship is one of association rather than cause.

Previous research has indicated that although individuals may feel better after exercising, the reasons for these changes may be due to the physical activity itself, having time away from life's daily hassles, or interacting with friends and family (Berger, 1996). Individuals have requirements (needs) for well-being that can only be met by relationships (Weiss, 1974). Perceived quality of life implies a subjective judgment affected by many variables. It is reasonable then to expect positive relationships between social support variables and quality of life.

A number of researchers have found correlations between perceived quality of life and social support (Andrews et al., 1978; Bowling et al., 1990; Caron et al., 1998; Klein, 1993). Mancini and Blieszner (1992) suggested that social interaction was particularly pertinent for explaining psychological well-being as people advance through life and experience changes in close relationships. The findings from this study indicate that social support was a contributing factor to the perceived changes in health-related quality of life. The participants that reported more reassurance of worth also perceived less role limitations due to emotional problems and improved mental health. However, nurturance and the reported role as care-giver appeared to impact negatively on mental and general health. This suggests that physical activity interventions consider the social support networks of participants when implementing programs to increase physical activity.

The time is right to employ additional resources to investigate the psychological benefits of an active lifestyle. As human beings live longer, they are becoming concerned about their quality of life, particularly the quality of their later years (Berger and Mott, 2001). Ensuring the quality of life of an unprecedented large elderly population will be one of the greatest challenges of this century (Kalache, 1999). The Ministry of Health, Canada (Kalache, 1999) has stated that, "Active aging is the process of optimizing opportunities for physical, social and mental well-being throughout the life course in order to extend healthy life expectancy." Therefore, it is crucial to ensure that older persons have every opportunity to remain active by promoting physical activity as a preventive measure. Just as good health sustains activity, it is a physically active life that will most likely be a healthy one (Kalache, 1999).

Limitations

1. Fourteen medical clinics in the Edmonton area were contacted in order to determine whether the physicians in those clinics would be willing to recruit participants for this study. Only four of those medical clinics agreed to meet with the researcher to discuss the recruitment protocol. Therefore, the medical clinics that agreed to participate by recruiting participants for the study may not accurately represent the typical medical clinic in the Edmonton area.
2. The physicians in the four clinics agreed to participate in this study. These physicians claimed to believe in the benefits of physical activity and preventive medicine and may not represent the beliefs of all physicians in the Edmonton area.
3. Furthermore, because each clinic/physician distributed the information packages in a manner that best suited the system employed in the clinic, the actual study sample of participants may not accurately represent the general 40-70 year old population in the Edmonton area.
4. The GLTEQ assesses self-reported physical activity in 20-minute bouts. The recommendations in Canada's Physical Activity Guide suggest that activity can be accumulated during the day in 10-minute bouts. The discrepancy, or mismatch between the physical activity measures and the recommendations in the Guide may have limited the findings in this study.
5. The 57 participants that agreed to participate in this study had already made a decision to become more physically active before they called the researcher. By

agreeing to participate, they were in fact *agreeing* to become more physically active. This is one possible reason that the intervention employed in this study was not successful. The participants did not need to be encouraged, or coached on how to include physical activity in their daily lives.

6. After an extended and rather lengthy recruitment phase, only 57 participants were recruited to the study and completed the testing procedure at time 1. Confidence in some analyses may be reduced due to factors such as the small sample size, low internal consistencies, and low observed power in some variables.
7. The theories chosen to support this study were useful tools to help explain the increases in physical activity and health-related quality of life scores reported by the participants. However, the Theory of Planned Behavior, Self-Efficacy and Social Provisions Scale were not able to explain the increases in physical fitness achieved by the participants in the study. It is possible that a different social-cognitive theory might better explain the decreases in heart rate observed.

Recommendations and Future Directions

Methods. Although this study ran smoothly from a practical standpoint, a number of recommendations can be made for future research in this area.

The PAR-Q was a useful screening tool for potential participants in the study, and should be included in similar research. When the participant called to inquire about the study, the researcher conducted the PAR-Q orally. If the participant answered "yes" to any question suggesting that there were contraindications for them to become physically active, the researcher simply asked permission to send a PAR-MedX to their family physician. The PAR-MedX is similar to the PAR-Q, but contains more detailed information and requires the physician's signature.

Future researchers should recruit medical clinics with an unbiased and random methodology. The researcher in the present study was given the names of physicians and clinics that believed in the benefits of physical activity and prevention of illness. While this method was practical from the researcher's viewpoint, this was not a random procedure, and therefore, results from the study may not be as generalizable.

Clinics vary in their procedure of escorting patients from the waiting room to the physician's office. Once the patient is taken to the physician's office, there is generally a short waiting period where the patient is left on his or her own. In the present study, the clinics that were most successful at recruiting participants gave the patient the information package to read while they were waiting for the physician. Patients that were in the correct age group and were not suffering from any known chronic diseases, or conditions were given an information package and asked to look at the materials while waiting for the physician. The patient had time to peruse the information letter and Canada's Physical Activity Guide before the physician arrived. The physician was also prompted to discuss the study when answering questions from the patient. This method of distributing information packages seemed to be a practical, effective and time conserving way to introduce the study to the potential participants.

The researcher found it extremely difficult to communicate with the physicians in the study. In some clinics the researcher was required to contact only the clinic manager because the physicians were too busy. In other cases, the researcher would not have her phone calls returned by the physicians. In future intervention research, a tentative follow-up plan should be determined with the contact person once the clinic has agreed to recruit participants. This would make the researcher accountable without feeling burdensome to the clinic staff.

The participants in the present study were highly motivated to become more physically active. However, there were many individuals that would have received information packages that chose not to participate in the study. Future research in this area should attempt to determine why these patients decided not to participate. In this study, the researcher was not permitted to contact these patients due to FOIP.

Practice. Physicians have claimed that time is a barrier when promoting physical activity to their patients. Future research in this area might consider utilizing the skills and availability of the nurses in the clinic rather than the physicians for a number of reasons. First, the nurse usually makes the initial contact with the patient when they arrive for their scheduled appointment. As explained previously, an opportunity exists at this point to introduce the study. Secondly, the nurse is more accessible for follow-up phone calls from the researcher. Lastly, the nurse may not feel burdened with extra work, as communicating with patients at the beginning of an appointment is part of their routine.

The participants in both conditions received Canada's Physical Activity Guide as part of the information package. The participants in the present study became more physically active regardless of what treatment condition they were assigned. Health Canada distributes these brochures for free. Therefore, Canada's Physical Activity Guide appears to be an economical tool to promote physical activity within a medical clinic setting. Surprisingly, three of the four medical clinics in this study were not aware of

Health Canada's efforts to promote physical activity with Canada's Physical Activity Guide.

Furthermore, participants in the both treatment conditions also received a fitness assessment before and after the three-month study. The motivating role of the fitness assessment can not be discounted in this study. Similar to other specialized diagnostic procedures performed within medical clinics, a certified physical activity consultant conducting fitness assessments may be a practical and effective method for moving our sedentary population toward more physically active lifestyles. Future research in this area might consider different treatment conditions that receive, or do not receive the fitness assessment to determine whether the motivating role of the test is pragmatic, as well as potent.

The majority of the participants in the study chose to walk as their means for becoming physically active. Only one participant joined a fitness club and hired a personal trainer. The participants in the study became more physically active, improved their mental and emotional well-being and became more physically fit by walking three to five times per week. Walking appears to be a viable method of promoting physical activity to middle-aged adults with busy schedules. Physicians, and the medical clinics they work in should promote walking to their patients. Participants in the study were pleasantly surprised to realize that they could obtain health benefits by walking on a regular basis.

In the present study, the physical activity consultant, and the intervention as it was implemented, had no apparent effect on the participants assigned to that condition. However, the participants from both treatment conditions had contact with the researcher on several occasions. In the future, medical clinics should consider employing physical activity consultants to promote physical activity as a preventive therapy and to assist their patients with their physical activity programs. A physical activity consultant working within the medical clinic would remove the burden of "lack of time" from the physician. In addition, consistency would be maintained with the types of messages conveyed to patients in an ongoing manner.

Theory. Physical activity interventions in the future must continue to include theory-based research. It is difficult to generalize intervention strategies to other populations when the reasons fundamental to the success, or failure of a program remain obscure. In order to develop programs that can be assessed, it is imperative that physical activity interventions utilize recognized theories of human behavior. Theory based research is built upon what is known, and therefore, the potential to develop promising interventions and improved health promotion strategies is enhanced.

The intervention in this study did not appear to be successful. The physical activity consultant met with participants assigned to the intervention condition on an individual basis. The intervention protocol suggested by CSEP was followed and maintained for each participant. However, because the manual does not follow a particular theoretical proposition, no specific theory constructs were targeted for change. For example, the physical activity consultant did not speak specifically to the participant's attitude about physical activity, how confident they felt about becoming more physically active, or how much time they spent as a care giver. Therefore, it was difficult to determine what aspects of the intervention were successful, and which were not. In this study, the consultation session with participants in the intervention group did not seem to add anything over and above the physician recommendation. These findings suggest that generalized types of helpful interventions are likely to be less effective than a theory based intervention that targets change in specific theory variables that have been associated with change in the target behavior.

Conclusions

The primary objectives of this research were to determine if a medical office-based intervention would increase self-reported physical activity levels and improve the health-related quality of life of sedentary middle-aged adults when implemented by a physical activity consultant in concert with clinic physicians.

There were no significant differences found between participants in each treatment condition (control and intervention) at time 2. As stated previously, this group of participants might have been highly motivated to become more physically active before contacting the researcher to volunteer for the study. The intervention suggested by CSEP (1996) may not be necessary when participants are already willing to incorporate physical activity into their lifestyle. No specific theory constructs were targeted for change in this intervention. Therefore, it would be difficult to determine whether change actually occurred because of the intervention, or some unknown reason.

The TPB was a useful tool for explaining the changes in physical activity behavior in this study. The strongest predictor of current physical activity was physical activity intention. In addition, the strongest predictor of physical activity intention was current physical activity. Both of these results are consistent with the TPB.

SE theory was an effective instrument for explaining the changes in the mental health-related quality of life components. These results are similar to those suggested by Rodgers and Gauvin (1998).

No theory used in this study was particularly useful for explaining the physical fitness changes. Two constructs from the TPB, more specifically, attitude and current physical activity did predict changes in pre-exercise heart rate. Future theory based research should continue to include an objective measure of physical activity in an effort to continue the work in this area.

Although the purpose of the study was to determine if an office-based intervention was an effective way to promote physical activity, and no significant difference was made by the intervention, participants in both treatment conditions improved equally over the course of the three-month study. The participants in both treatment conditions reported that they were more physically active and that their perceived health-related quality of life had also improved. Furthermore, when physical fitness (heart rate) was measured objectively during the sub-maximal treadmill test, participants increased their fitness levels.

Each participant received physician advice to become more physically active and a copy of Canada's Physical Activity Guide. If patients were receptive to physician advice about increasing their physical activity, an effective and economical method to motivate 40-70 year old adults to become physically active would be to provide physician advice and a copy of Canada's Physical Activity Guide. The frequency with which patients visit primary care physicians suggests a tremendous opportunity to provide preventive services in a day-to-day practice (Pate, et al., 1995; Reed, et al., 1991).

Adopting an active lifestyle can help maintain one's mobility and physical independence (O'Brien Cousins and Vertinsky, 1991). Physical activity participation may have important health-related quality of life benefits in terms of perceived health in older populations (Stewart et al., 1993). Walking three to five times per week enhanced the mental and emotional well-being of the participants in this study. King, et al., (1989) reported similar findings in a controlled trial of healthy middle-aged adults.

The rising cost of health care in Canada is a major public policy issue. Preventive action now, could reduce the number of seniors requiring extensive medical care in the future. Physical dysfunction is one factor leading to increased health care utilization (Stewart et al., 1993). Active adults demonstrate less degeneration in strength, bone mass, and cognitive function (Buchner and Wagner, 1992; Pate et al., 1995). Therefore, increased physical activity participation could in turn help to ease the burden on the health-care system in Canada.

Future physical activity interventions that target sedentary middle-aged adults to increase their daily physical activity levels would be an investment. There would be tremendous enhancement of public health and to individual well-being if sedentary adults would adopt a more active lifestyle (Goldstein, et al., 1999). An increase in physical activity during mid-life is associated with a decreased risk of mortality (Pate et al., 1995). In addition, the benefits of a physically active lifestyle could be experienced and enjoyed for a greater number of years (Calfas, et al., 1997). In conclusion, future research should continue to promote physical activity in medical clinics. The immediate benefits experienced by each physically active individual, will enhance the public's health and the Canadian health-care system in years to come.

REFERENCES

Adams, B. (1968). Kinship in an urban setting. Chicago: Markham.

Ajzen, I. (1988). Attitudes, personality, and behavior. Chicago: Dorsey Press.

Ajzen, I., and Driver, B. (1993). "Application of the theory of planned behavior to leisure choice." Journal of Leisure Research. 24 (3), 207-224.

Ajzen, I., and Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice Hall.

Ajzen, I., and Madden, T. (1986). "Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control." Journal of Experimental Social Psychology. 22 (5), 453-474.

American College of Sports Medicine (ACSM). (1998). The Recommended Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory and Muscular Fitness, and Flexibility in Healthy Adults." Medicine and Science in Sports and Exercise. 30 (6), 975-991.

Andrew, G., Oldridge, N., Parker, J., Cunningham, D., Rechnitzer, P., Jones, N., et al. (1981). "Reasons for dropout from exercise programs in post-coronary patients." Medicine and Science in Sports and Exercise. 13, 164-168.

Andrews, F., Tennant, C., Hewson, D., and Vaillant, G. (1978). "Life event stress, social support, coping style and risk of psychological impairment." The Journal of Nervous and Mental Disease. 166, 307-316.

Argyle, M. (1999). "Causes and correlates of happiness." Well-being: The foundations of hedonic psychology. D. Kahneman, E. Diener and N. Schwarz (Eds.). (pp. 353-373). New York: Russell Sage Foundation.

Armitage, C., and Conner, M. (1999). "The theory of planned behavior: Assessment of predictive validity and 'perceived control'." British Journal of Social Psychology. 38 (1), 35-54.

Australian Sports Commission. (1997). Active Australia. Canberra, Australia: Australian Sports Commission.

Balke, B., and Ware, R. (1959). "An experimental study of physical fitness of air force personnel." U. S. Armed Forces Medical Journal. 10, 675.

Bandura, A. (1986). Social Foundations of Thought and Action. Englewood Cliffs, NJ: Prentice Hall.

Barry, H., and Eathorne, S. (1994). "Exercise and Aging." Sports Medicine. 78 (2), 357-376.

Berger, B. (1996). "Psychological benefits of an active lifestyle: What we know and what we need to know." Quest. 48, 330-353.

Berger, B., and McInman, A. (1993). "Exercise and the quality of life." Handbook of Research on Sport Psychology. R. Singer, M. Murphey and L. Tennant (Eds.). (pp. 729-760). New York: Macmillan.

Berger, B., and Mott, R. (2000). "Exercise and Mood: A subjective review and synthesis of research employing the Profile of Mood States." Journal of Applied Sport Psychology. 12, 69-92.

Berger, B., and Mott, R. (2001). "Physical activity and quality of life." Handbook of Sport Psychology. (2nd Edition). R. Singer, H. Hausenblas and C. Janelle (Eds.). (pp. 636-671). New York: John Wiley and Sons, Inc.

Berger, B., and Owen, D. (1988). "Stress reduction and mood enhancement in four exercise modes: Swimming, body conditioning, Hatha yoga and fencing." Research Quarterly for Exercise and Sport. 59, 148-159.

Berger, B., and Owen, D. (1998). "Relation of low and moderate intensity exercise with acute mood change in college joggers." Perceptual and Motor Skills. 87, 611-621.

Bortz, W. (1982). "Disuse and aging. Journal of the American Medical Association. 248 (10), 1203-1208.

Buchner, D. (1997). "Preserving Mobility in Older Adults." Western Journal of Medicine. 167, 258-264.

Butki, B., and Rudolph, D. (1997). "Self-efficacy and affective responses to short bouts of exercise." Journal of Sport and Exercise Psychology. 19, S38.

Butler, R., Davis, R., Lewis, C., Nelson, M., and Strauss, E. (1998). "Physical fitness: How to help older patients live stronger and longer." Geriatrics. 53 (9), 26-40.

Biddle, S., and Fox, K. (1998). "Motivation for physical activity and weight management." International Journal of Obesity and Related Metabolic Disorders. 22 (S2), S39-S47.

Blair, S. (1995). "Measurement of physical activity." In K. D. Brownell and C. G. Fairburn (Eds.), Eating Disorders and Obesity. (pp. 111-116). New York: Guilford Press.

Blair, S., Applegate, W., Dunn, A., Ettinger, W., Haskell, W., King, A., Morgan, T., Shih, J., and Simons-Morton, D. (1998). "Activity Counseling Trial (ACT): Rationale, Design, and Methods." Medicine & Science in Sports & Exercise. 30 (7), 1097-1106.

Blair, S., Haskell, W., Ho, P. Paffenbarger, R., Vranizan, K., Farquhar, J., and Wood, P. (1985). "Assessment of Habitual Physical Activity by a Seven-Day Recall in a Community Survey and Controlled Experiments." American Journal of Epidemiology. 122 (5), 794-804.

Blair, S., Kohl, H., Paffenbarger, R., Clark, D., Cooper, K., and Gibbons, L. (1989). "Physical fitness and all-cause mortality. A prospective study of healthy men and women." Journal of the American Medical Association. 262, 2395-2401.

Bortz, W. (1982). "Disuse and aging. Journal of the American Medical Association. 248 (10), 1203-1208.

Bowling, A., Farkhar, M., Grundy, E., and Formby, J. (1993). Changes in life satisfaction over a two and a half year period among very elderly people living in London. Social Sciences & Medicine. 36, 641-655.

Brenes, G., Strube, M., and Storandt, M. (1998). "An application of the theory of planned behavior to exercise among older adults." Journal of Applied Social Psychology. 28 (24), 2274-2290.

Buchner, D. (1997). "Preserving Mobility in Older Adults." Western Journal of Medicine. 167, 258-264.

Buchner, D., and Wagner, E. (1992). "Preventing Frail Health." Clinics in Geriatric Medicine. 8, 1-17.

Bull, F., and Jamrozik, K. (1998). Advice on exercise from a family physician can help sedentary patients to become active. American Journal of Preventive Medicine. 15 (2), 85-94.

Butki, B., and Rudolph, D. (1997). "Self-efficacy and affective responses to short bouts of exercise." Journal of Sport and Exercise Psychology. 19, S38.

Butler, R., Davis, R., Lewis, C., Nelson, M., and Strauss, E. (1998). "Physical fitness: How to help older patients live stronger and longer." Geriatrics. 53 (9), 26-40.

Calfas, K., Long, B., Sallis, J., Wooten, W., Pratt, M., and Patrick, K. (1996). "A Controlled Trial of Physician Counselling to Promote the Adoption of Physical Activity." Preventive Medicine. 25, 225-233.

Calfas, K., Sallis, J., Oldenburg, B., and Ffrench, M. (1997). "Mediators of Change in Physical Activity Following an Intervention in Primary Care: PACE." Preventive Medicine. 26, 297-304.

Canadian Institute for Health Information. (2000). Canada's elderly primary users of hospitals reports Canadian Institute for Health Information. News Release - Wednesday, March 29, 2000. [Online]. Available: http:/www.cihi.ca/medrls/29mar2000.shtml [June 22, 2001]

Canadian Institute for Health Information. (2000). "Age and sex differences in provincial/territorial government health expenditure." Total Health Care Spending to Top $95 Billion, Reports Canadian Institute for Health Information. News Release - December 11, 2000. [Online]. Available: http://www.cihi.ca/medrls/11dec2000.shtml [June 22, 2001]

Canadian Society for Exercise Physiology. (1996). The Canadian Physical Activity, Fitness & Lifestyle Appraisal: CSEP's Plan for Healthy Active Living.

Caron, J., Tempier, R., Mercier, C., and Leouffre, P. (1998). "Components of social support and quality of life in severely mentally ill, low income individuals and a general population group." Community Mental Health Journal. 34 (5), 459-475.

Conner, M., and Armitage, C. (1998). "Extending the theory of planned behavior: A review and avenues for further research." Journal of Applied and Social Psychology. 28 (15), 1429-1464.

Courneya, K. (1995a). "Understanding readiness for regular physical activity in older individuals: An application of the theory of planned behavior." Health Psychology. 14, 80-87.

Courneya, K., and McAuley, E. (1995). "Are there different determinants of the frequency, intensity, and duration of physical activity?" Behavioral Medicine. 20 (2), 84-90.

Courneya, K., and McAuley, E. (1996). "Reliability and Discriminant Validity of Subjective Norm, Social Support, and Cohesion in an Exercise Setting." Journal of Sport & Exercise Psychology. 17, 325-337.

Cutrona, C., and Russell, D. (1987). "The provisions of social relationships and adaptation to stress." Advances in personal relationships. (pp. 37-67). W. Jones and D. Perlman (Eds.). Greenwich, CT: JAI Press.

Daltroy, L., and Godin, G. (1989). "Spouse intention to encourage cardiac patient participation in exercise." American Journal of Health Promotion. 4, 12-17.

Dean, A., Kolodny, B., and Wood, P. (1990). "Effects of social support from various sources on depression in elderly persons." Journal of Health and Social Behavior. 31, 148-161.

DeVellis, B., Blalock, S., and Sandler, R. (1990). "Predicting participation in cancer screening: the role of perceived behavioral control." Journal of Applied Social Psychology. 20, 639-660.

Despres, L., and Lamarche, B. (1994). "Low intensity endurance exercise training, plasma lipoproteins and the risk of coronary heart disease." Journal of Internal Medicine. 236, 7-22.

Devereaux, K., Futrell, M., Williamson, E., Chamberlain, C., Bourque, A., MacDonnell, M., et al. (1996). "Perceptions of physical fitness and exercise activity among older adults." Journal of Advanced Nursing. 23, 542-547.

DiLorenzo, T., Bargman, E., Stucky-Ropp, R., Brassington, G., Frensch, P., and LaFontaine, T. (1999). "Long-Term Effects of Aerobic Exercise on Psychological Outcomes." Preventive Medicine. 28, 75-85.

DiTommaso, E., and Spinner, B. (1997). "Social and emotional loneliness: A re-examination of Weiss' typology of loneliness." Personality & Individual Differences. 22 (3), 417-427.

Dishman, R. (1988). "Overview." In R. K. Dishman (Ed.), Exercise Adherence: Its Impact on Public Health. (pp. 1-9). Champaign, IL: Human Kinetics.

Dishman, R., and Buckworth, J. (1996). "Increasing physical activity: a quantitative synthesis." Medicine and Science in Sports and Exercise. 28 (6),706-719.

Dunn, A., Anderson, R., and Jakicic, J. (1998). "Lifestyle Physical Activity Interventions." American Journal of Preventive Medicine. 15 (4), 398-412.

Dunn, A., Marcus, B., Kampert, J., Garcia, M., Kohl, H., and Blair, S. (1999). "Comparison of Lifestyle and Structured Interventions to Increase Physical Activity and Cardiorespiratory Fitness." Journal of the American Medical Association. 281 (4), 327-334.

Eaton, C., and Menard, L. (1998). "A Systematic Review of Physical Activity Promotion in Primary Care Office Settings." British Journal of Sports Medicine. 32, 11-16.

Ekblom, B., Astrand, P., Saltin, B., Stenberg, J., and Wallstrom, B. (1968). "Effect of Training on circulatory response to exercise." Journal of Applied Physiology. 24 (4), 518-528.

Epstein, L. (1998). "Integrating Theoretical Approaches to Modify Physical Activity." American Journal of Preventive Medicine. 15 (4), 257-265.

Fletcher, G., Blair, S., Blumenthal, J., Caspersen, C., Chailman, B., Epstein, S. et al. (1992). "Position Statement on Exercise: Benefits and Recommendations for Physical Activity Programs for all Americans." Circulation. 86, 340-344.

Frandin, K., Mellstrom, D., Sundh, V., and Grimby, G. (1995). "A life span perspective on patterns of physical activity and functional performance at the age of 76." Gerontology. 41, 109-120.

Gatch, C., and Kendzierski D. (1990). "Predicting exercise intentions: the theory of planned behavior." Research Quarterly for Exercise and Sport. 61, 100-102.

Godin, G. (1995). "Theories of reasoned action and planned behavior: Usefulness for exercise promotion." Medicine & Science in Sports & Exercise. 26 (11), 1391-1394.

Godin, G., and Shephard, R. (1985). "A simple method to assess exercise behavior in the community." Canadian Journal of Applied Sports Sciences. 10, 141-146.

Godin, G., and Shephard, R. (1990). "An evaluation of the potential role of the physician in influencing community exercise behavior. American Journal of Health Promotion. 4, 255-259.

Godin, G., Valois, P., and Lepage, I. (1993). "The pattern of influence of perceived behavioral control upon exercising behavior: an application of Ajzen's theory of planned behavior." Journal of Behavioral Medicine. 16, 81-102.

Godin, G., Valois, P., Lepage, I., and Desharnais, R. (1992). "Predictors of smoking behavior: an application of Ajzen's theory of planned behavior." British Journal of Addiction. 87, 1335-1343.

Goldstein, M., Pinto, B., Lynn, H., Jette, A., Rakowski, W., McDermott, S., DePue, J., Milan, F., Dube, C., and Tennstedt, S. (1999). "Physician-based physical activity counseling for middle-aged and older adults: a randomized trial." Annals of Behavioral Medicine. 21 (1), 40-47.

Graham-Clarke, P., and Oldenburg, B. (1994). "The effectiveness of a general practice-based physical activity intervention on patient physical activity status." Behavior Change. 11, 132-144.

Grimby, G. (1995). "Physical performance, physical activity and quality of life in elderly people." Scandinavian Journal of Medicine & Science in Sports. 5, 127-128.

Grimm, R., Grandits, G., Cutler, J., Stewart, A., McDonald, R., Svendsen, K., et al. (1997). "Relationships of Quality of Life Measures to Long-term Lifestyle and Drug Treatment in the Treatment of Mild Hypertension Study." Archives of Internal Medicine. 157, 638-648.

Grueninger, U., Duffy, F., and Goldstein, M. (1995). "Patient education in the medical encounter: How to facilitate learning, behavior change, and coping. In M. Lipkin, S. Putnam, and A. Lazare (Eds.). The Medical Interview. New York: Springer-Verlag.

Guyatt, G., Feeny, D., and Patrick, D. (1993). "Measuring Health-related Quality of Life." Annals of Internal Medicine. 118, 622-629.

Harris, S., Caspersen, C., DeFriese, G., and Estes, H. (1989). Physical activity counseling for healthy adults as a primary preventive intervention in the clinical setting. Report for the U. S. Preventive Services Task Force. Journal of the American Medical Association. 261 (24), 3590-3598.

Health Canada. (1998). Canada's Handbook for Physical Activity Guide to Healthy Active Living.

Health Canada. (1998). Facts on Current Physical Activity Levels of Canadians Relative to Requirements of Canada's Physical Activity Guide to Healthy Active Living. In Physical Activity Guide - News Release. [Online]. Available: http://www.paguide.com/english/back3e.htm [March 23, 1999]

Health Canada. (1998). Questions & Answers - Canada's Physical Activity Guide to Healthy Active Living. In Physical Activity Guide - News Release. [Online]. Available: http://www.paguide.com/english/back2e.htm [March 23, 1999]

Health Canada. (1998). Speaking Notes for Dr. Francine Lemire, President College of Family Physicians of Canada. In Physical Activity Guide - News Release. [Online]. Available: http://www.paguide.com/english/docsnotes.htm [March 23, 1999]

Health Canada, Statistics Canada and Canadian Institute for Health Information. (1999). Statistical Report on the Health of Canadians. (pp. 188-191). Ottawa: Health Canada.

Health Protection Branch - Laboratory Centre for Disease Control. (1997). Economic Burden of Illness in Canada; 1993 - Summary of Results. [Online]. Available: http://www.hc-sc.gc.ca/hpb/lcdc/publicat/burden/burd4-e.html [March 23, 1999]

Helmrich, S., Ragland, D., Leung, R., and Paffenbarger, R. (1991). "Physical Activity and Reduced Occurrence of Non-insulin-dependent Diabetes Mellitus." New England Journal of Medicine. 325, 147-152.

Hillsdon, M. (1998). "Promoting Physical Activity: Issues in Primary Health Care." International Journal of Obesity and Related Metabolic Disorders. 22 (Supp. 2), S52-54.

Hoffman, C., Rice, D., and Sung, H. (1996). "Persons With Chronic Conditions: Their Prevalence and Costs." Journal of the American Medical Association. 276, 1478-1479.

Huang, Y., Macera, C., Blair, S., Brill, P., Kohl, H., and Kronenfeld, J. (1998). "Physical Fitness, Physical Activity, and Functional Limitation in Older Adults." Medicine and Science in Sports and Exercise. 30, 1430-1435.

Janis, I. (1983). Short Term Counseling. New Haven, CT: Yale University Press.

Jin, P. (1992). "Efficacy of Tai Chi, brisk walking, meditation and reading in reducing mental and emotional stress." Journal of Psychosomatic Research. 36, 361-370.

Kalache, A. (1999). "Active ageing makes the difference." Bulletin of the World Health Organization. 77 (4), 299.

Kaplan, R. (1994). "The Ziggy theorem: Toward an outcomes-focused health psychology." Health Psychology. 13, 451-460.

Kelly, M. (1992). "Health Promotion in Primary Care: Taking Account of the Patients Point of View." Journal of Advanced Nursing. 17, 1291-1296.

Kerner, M., and Grossman, A. (1999). "Attitudinal, social, and practical correlates to fitness behavior: A test of the theory of planned behavior." Perceptual & Motor Skills. 87 (3, Part 2), 1139-1154.

Kimiecik, J. (1992). "Predicting vigorous physical activity of corporate employees: comparing the theories of reasoned action and planned behavior." Journal of Sport & Exercise Psychology. 14 (2), 192-206.

King, A. (1994). "Clinical and community interventions to promote and support physical activity participation." In R. K. Dishman (Ed.), Advances in Exercise Adherence. (pp. 183-212). Champaign, IL: Human Kinetics.

King, A., Haskell, W., Young, D., Oka, R., and Stefanick, M. (1995). "Long-term effects of varying intensities and formats of physical activity on participation rates, fitness, and lipoproteins in men and women aged 50 to 65 years." Circulation. 91, 2596-2604.

King, A., Rejeski, J., and Buchner, D. (1998). "Physical Activity Interventions Targeting Older Adults. A Critical Review and Recommendations." American Journal of Preventive Medicine. 15 (4), 316-333.

King, A., Sallis, J., Dunn, A., Simons-Morton, D., Albright, C., Cohen, S., Rejeski, J., Marcus, B., and Coday M. (1998). "Overview of the Activity Counseling Trial (ACT) Intervention for Promoting Physical Activity in Primary Health Care Settings." Medicine and Science in Sports and Exercise. 30 (7), 1086-1096.

King, A., Taylor, C., Haskell. W., and DeBusk, R. (1989). "Influence of regular aerobic exercise on psychological health: a randomized, controlled trial of healthy middle-aged adults." Health Psychology. 8, 305-324.

Klein, H. (1993). "Home satisfaction: Health and psychosocial variables." Journal of Applied Gerontology. 12, 439-441.

Kreuter, M., Scharff, D., Brennan, L., and Lukwago, S. (1997). "Physician Recommendations for Diet and Physical Activity: Which Patients Get Advised to Change?" Preventive Medicine. 26, 825-833.

Laforge, R., Rossi, J., Prochaska, J., Velicer, W., Levesque, D., and McHorney, C. (1999). "Stage of Regular Exercise and Health-Related Quality of Life." Preventive Medicine. 28, 349-360.

Lee, G., and Ellithorpe, E. (1982). "Intergenerational exchange and subjective well-being among the elderly." Journal of Marriage and the Family. 44, 217-224.

Lee, I. (1994). "Physical Activity, Fitness, and Cancer." In C. Bouchard, R. Shephard, and T. Stephens (Eds.), Physical Activity, Fitness, and Health (pp. 814-831). Champaign, ILL: Human Kinetics.

Levy, W., Cerqueira, M., Harp, G., Johannessen, K., Abrass, I., Schwartz, R. et al. (1998). "Effect of endurance exercise training on heart rate variability at rest in healthy young and old men." American Journal of Cardiology. 82 (10), 12361241.

Lewis, B., and Lynch W. (1993). "The Effect of Physician Advice on Exercise Behaviour." Preventive Medicine. 22, 110-121.

Licht, M. (1995). "Multiple regression and correlation." Reading and understanding multivariate statistics. L. Grimm and P. Yarnold (Eds.). Washington, DC: American Psychological Association.

Logsdon, D., Lazaro, C., and Meier, R. (1989). "The feasibility of behavioral risk reduction in primary medical care." American Journal of Preventive Medicine. 5, 249-256.

MacKeigan, L., and Pathak, D. (1992). "Overview of health-related quality-of-life measures." American Journal of Hospital Pharmacology. 49, 2236-2245.

Madden, T., Ellen, P., and Ajzen, I. (1992). "A comparison of the theory of planned behavior and the theory of reasoned action." Personality & Social Psychology Bulletin. 18 (1),
3-9.

Mancini, J. (1989). Aging parents and adult children. Lexington, MA: Lexington Books.

Mancini, J., and Bliesaner, R. (1992). "Social provisions in adulthood: Concept and measurement in close relationships." Journals of Gerontology. 47 (1), 14-20.

Manstead, A., and van Eekelen, S. (1998). "Distinguishing between perceived behavioral control and self-efficacy in the domain of academic achievement intentions and behaviors." Journal of Applied Social Psychology. 28, 1375-1392.

Marcus, B., Goldstein, M., Jette, A., Simkin-Silverman, L., Pinto, B., Milan, F., Washburn, R., Smith, K., Rakowski, W., and Dube, C. (1997). "Training Physicians to Conduct Physical Activity Counseling." Preventive Medicine. 26, 382-388.

Mazzeo, R., Cavanagh, P., Evans, W., Fiatarone, M., Haberg, J., McAuley, E., et al. (1998). "Exercise and Physical Activity for Older Adults." Medicine and Science in Sports & Exercise. 30 (6), 992-1008.

McCaul, K., Sandgren, A., O,Neill, H., and Hinsz, V. (1993). "The value of the theory of planned behavior, perceived control, and self-efficacy expectations for predicting health-protective behaviors." Basic and Applied Social Psychology. 14, 231-252.

McCauley, E., and Courneya, K. (1993). "Adherence to exercise and physical activity as health-promoting behaviors: Attitudinal and self-efficacy influences." Applied and Preventive Psychology. 2, 65-77.

McCauley, E., Courneya, K., Rudolph, D., and Lox, C. (1994). Enhancing exercise adherence in middle-aged males and females. Preventive Medicine. 23, 498-506.

McMurdo, M., and Burnett, L. (1992). "Randomised controlled trial of exercise in the elderly." Gerontology. 38 (5), 292-298.

Meichenbaum, D. (1985). Stress inoculation training. New York, NY: Pergamon.

Michels, T., and Kugler, J. (1998). "Predicting exercise in older Americans: using the theory of planned behavior." Military Medicine. 163 (8), 524-529.

Milesis, C., Pollock, M., Bah, M., Ayres, J., Ward, A., and Linnerud, A. (1976). "Effects of different durations of physical training on cardiorespiratory function, body composition, and serum lipids." Research Quarterly. 47 (4), 716-725.

Millstein, S. (1996). "Utility of the theories of reasoned action and planned behavior for predicting physician behavior: A prospective analysis." Health Psychology. 15 (5), 398-402.

Minister of Industry. (1999). Canadian Statistics - Population Estimate. [Online]. Available: http://www.statcan.ca/english/Pgdb/People/Population/demo23b.htm [March 23, 1999]

Montano, D., Kasprzyk, D., and Taplin, S. (1997). "The theory of reasoned action and the theory of planned behavior." Health Behavior and Health Education. K. Glanz, F. Lewis, and B. Rimer (Eds.). San Francisco: Jossey-Bass Inc.

Mullins, L., and Dugan, E. (1990). "The influence of depression, and family and friendship relations, on residents loneliness in congregate housing." The Gerontologist. 30, 377-384.

Mullins, L., and Dugan, E. (1991). "Elderly social relationships with adult children and close friends and depression." Journal of Social Behavior & Personality. 6 (2), 315-328.

Nguyen, M., Otis, J., and Potvin, L. (1996). "Determinants of intention to adopt a low-fat diet in men 30 to 60 years old: Implications for heart health promotion." American Journal of Health Promotion. 10 (3), 201-201.

Norman, P., and Conner, M. (1996). "Predicting health-check attendance among prior attenders and nonattenders: The role of prior behavior in the theory of planned behavior." Journal of Applied Social Psychology. 26 (11), 1010-1026.

O'Brien Cousins, S., and Vertinski, P. (1991). "Unfit Survivors: Exercise as a Resource for Aging Women." The Gerontologist. 31 (3), 347-357.

Oman, R., and King, A. (1998). "Predicting the adoption and maintenance of exercise participation using self-efficacy and previous exercise participation rates." American Journal of Health Promotion, 12 (3), 154-161.

Paffenbarger, R., Hyde, R., Wing, A., and Hsieh, C. (1986). "Physical Activity, All-cause Mortality, and Longevity of College Alumni." New England Journal of Medicine. 314, 605-613.

Parker, D., Manstead, A., and Stradling, S. (1995). "Extending the theory of planned behavior: The role of personal norm." British Journal of Social Psychology. 34 (2), 127-137.

Pate, R., Pratt, M., Blair, S., et al. (1995). "Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine." Journal of the American Medical Association. 273, 402-407.

Pender, N., Sallis, J., Long, B., and Calfas, K. (1994). "Health-care provider counseling to promote physical activity." In R. K. Dishman (Ed.), Advances in Exercise Adherence. (pp. 213-235). Champaign, IL: Human Kinetics.

Pinto, B., Goldstein, M., and Marcus, B. (1998). "Activity Counseling by Primary Care Physicians." Preventive Medicine. 27, 506-513.

Pollock, M. (1973). "The Quantification of Endurance Training Programs." Exercise & Sport Sciences Reviews. 1, 155-188.

Reed, B., Jensen, J., and Gorenflo, D. (1991). "Physicians and Exercise Promotion." American Journal of Preventive Medicine. 7, 410-415.

Reid, E., and Morgan, R. (1979). "Exercise prescription: a clinical trial." American Journal of Public Health. 69, 591-595.

Rejeski, W., Brawley, L., and Schumaker, S. (1996). "Physical activity and health-related quality of life." Exercise Sport and Science Reviews. 24, 71-108.

Rodgers, W., and Sullivan, M. (2001). "Task, coping, and scheduling self-efficacy in relation to frequency of physical activity." Journal of Applied Social Psychology. 31 (4): 741-753.

Rodgers, W., and Gauvin, L. (1998). "Heterogeneity of incentives for physical activity and self-efficacy in highly active and moderately active women exercisers." Journal of Applied Social Psychology. 28 (11): 1016-1029.

Rodgers, W., Blanchard, C., Bell, G., Wilson, P., and Gesell, J. (In press). "The motivational implications of characteristics of exercise bouts." Journal of Health Psychology.

Rosen, M., Logsdon, D., and Demak, M. (1984). "Prevention and Health Promotion in Primary Care: Baseline Results on Physicians from the INSURE Project on Lifecycle Preventive Health Services." Preventive Medicine. 13, 535-548.

Russell, D., and Cutrona, C. (1984). The provisions of social relationships and adaptations to stress. Paper presented at the American Psychological Association convention, Toronto, Canada.

Ruuskanen, J., and Ruoppila, I. (1995). "Physical Activity and Psychological Well-being among People Aged 65 to 84 Years." Age and Ageing. 24, 292-296.

Sallis, J., and Melbourne, H. (1990). "Determinants of Exercise." Exercise & Sport Sciences Reviews. 18, 307-327.

Saltin, B., Hartley, L., Kilbom, A., and Astrand, I. (1969). "Physical training in sedentary middle-aged and older men. II. Oxygen uptake, heart rate, and blood lactate concentration at submaximal and maximal exercise." Scandinavian Journal of Applied Physiology. 24 (4), 518-528.

Schifter, D., and Ajzen, I. (1985). "Intention, perceived control, and weight loss: an application of the theory of planned behavior." Journal of Personality and Social Psychology. 49, 843-851.

Shephard, R. (1999). "How much activity is needed for good health." International Journal of Sports Medicine. 20 (1), 23-27.

Simons-Morton, D., Calfas, K., Oldenburg, B., and Burton, N. (1998). "Effects of Interventions Health Care Settings on Physical Activity or Cardiorespiratory Fitness." American Journal of Preventive Medicine. 15 (4), 413-430.

Statistics Canada. (1998). "Overview." National Population Health Survey. 1996-97. Ottawa: Minister of Industry, 1998 (Statistics Canada Cat. No. 82-567-XPB).

Steptoe, A., Kearsley, N., and Walters, N. (1993). "Acute mood response to maximal and submaximal exercise in active and inactive men." Psychology & Health. 8, 89-99.

Stevens, W., Hillsdon, M., Thorogood, M., and McArdle, D. (1998). "Cost-effectiveness of a Primary Care Based Physical Activity Intervention in 45-74 Year Old Men and Women: A Randomized Controlled Trial." British Journal of Sports Medicine. 32, 234-241.

Stewart, A., King, A., and Haskell, W. (1993). "Endurance exercise and health-related quality of life in 50-65-year-old adults." Gerontologist. 33, 782-789.

Stewart, A., Hays, R., Wells, K., and Rogers, W., et al., (1994). "Long-term functioning and well being outcomes associated with physical activity and exercise in patients with chronic conditions in the activity and exercise in the Medical Outcomes Study." Journal of Clinical Epidemiology. 47 (7), 719-730.

Swinburn, B., Walter, L., Arroll, B., Tilyard, M., and Russell, D. (1997). Green prescriptions: Attitudes and perceptions of general practitioners towards prescribing exercise. British Journal of General Practice. 47, 567-569.

Swinburn, B., Walter, L., Arroll, B., Tilyard, M., and Russell, D. (1998). "The Green Prescription Study: A Randomized Controlled Trial of Written Exercise Advice Provided by General Practitioners." American Journal of Public Health. 88 (2), 288-291.

Tai, S., Gould, M., and Iliffe, S. (1997). Promoting healthy exercise among older people in general practice: Issues in designing and evaluating therapeutic interventions. British Journal of General Practice. 47 (415), 119-122.

Terry, D., and O'Leary, J. (1995). "The theory of planned behavior: The effects of perceived behavioral control and self-efficacy." British Journal of Social Psychology. 34 (2), 199-220.

Thayer, R. (1987). "Energy, tiredness, and tension effects of a sugar snack versus moderate exercise." Journal of Personality and Social Psychology. 52, 119-125.

Thoden, J. (1991). "Testing aerobic power." Physiological Testing of the High-Performance Athlete. (2nd Edition). J. MacDougall, H. Wenger, and H. Green (Eds.). (pp. 107-173). Champaign, Il: Human Kinetics.

Thompson, R., Taplin, S., McAfee, T., Mandelson, M., and Smith, A. (1995). "Primary and Secondary Prevention Services in Clinical Practice: Twenty Years, Experience in Development, Implementation and Evaluation." Journal of the American Medical Association. 14, 1130-1135.

U. S. Preventive Services Task Force. (1989). Guide to Clinical Preventive Services: An Assessment of the Effectiveness of 169 Interventions (pp. 297-304). Baltimore, MD: Williams and Wilkins.

van Ryn, M., Lytle, L., and Kirscht, J. (1996). "A test of the theory of planned behavior for two health-related practices." Journal of Applied Social Psychology. 26 (10), 871-883.

Verplanken, B., Aarts, H., Knippenberg, A., and Moonen, A. (1998). "Habit versus planned behavior: A field experiment." British Journal of Social Psychology. 37 (1), 111-128.

Wallace, P., Brennan, P., and Haines, A. (1987). "Are general practitioners doing enough to promote healthy lifestyles?" Findings of the Medical Research Councils general practice research framework study on lifestyle and health. British Medical Journal. 294, 940-942.

Wallston, B., Alagna, S., DeVellis, B., and DeVellis, R. (1983). "Social support and physical health." Health Psychology. 2, 367-391.

Wankel, L., Mummery, W., Stephens, T., and Craig, C. (1994). "Prediction of physical activity intention from social psychological variables: Results from the Campbell's survey of well-being." Journal of Sport & Exercise Psychology. 16, 56-69.

Ware, J., Kosinski, M., Bayliss, M., McHorney, C., Rogers, W., and Raczek, A. (1995). "Comparison of Methods for the Scoring and Statistical Analysis of SF-36 Health Profile and Summary Measures: Summary of Results from the Medical Outcomes Study." Medical Care. 33 (4), AS264-AS279.

Ware, J., and Sherbourne, C. (1992). "The MOS 36-Item Short-Form Health Survey (SF-36). Conceptual Framework and Item Selection." Medical Care. 30 (6), 473-483.

Weiss, R. (1974). "The provisions of social relationships." Doing unto others. (pp. 17-26). Z. Rubin (Ed.). Englewood Cliffs, NJ: Prentice Hall.

Wells, K., Lewis, C., Leake, B., Schleiter, M., and Brook, R. (1986). "The practices of general and sub-specialty internists in counseling about smoking and exercise." American Journal of Public Health. 76, 1009-1013.

World Health Organization. (1958). Constitution of the World health Organization. Annex I. In: The first ten years of the World Health Organization. Geneva: World Health Organization.

Wiest, J., and Lyle, R. (1997). "Physical activity and exercise: a first step to health promotion and disease prevention in women of all ages." Women's Health Issues, 7 (1), 10-16.

BIBLIOGRAPHY

American College of Sports Medicine. (1998). ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription (3rd ed.). Baltimore, MD: Williams and Wilkins.

Berg, K., and Latin, R. (1994). Essentials of Modern Research Methods in Health, Physical Education, and Recreation. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Drew, C., Hardman, M., and Weaver Hart, A. (1996). Designing and Conducting Research. Inquiry in Education and Social Science (2nd ed.). Boston, MA: Allyn and Bacon.

Foot, David K. (1998). Boom Bust & Echo 2000. Profiting from the Demographic Shift in the New Millennium (2nd ed.). Toronto, Canada: Macfarlane Walter and Ross.

Locke, L., Spirduso, W., and Silverman, S. (1987). Proposals that Work. A Guide for Planning Dissertations and Grant Proposals (2nd ed.). Newbury Park, CA: Sage Publications.

Montoye, H., Kemper, H., Saris, W., and Washburn, R. (1996). Measuring Physical Activity and Energy Expenditure. Champaign, IL: Human Kinetics.

Neuman, W. Lawrence. (1991). Social Research Methods. Boston, MA: Allyn and Bacon.

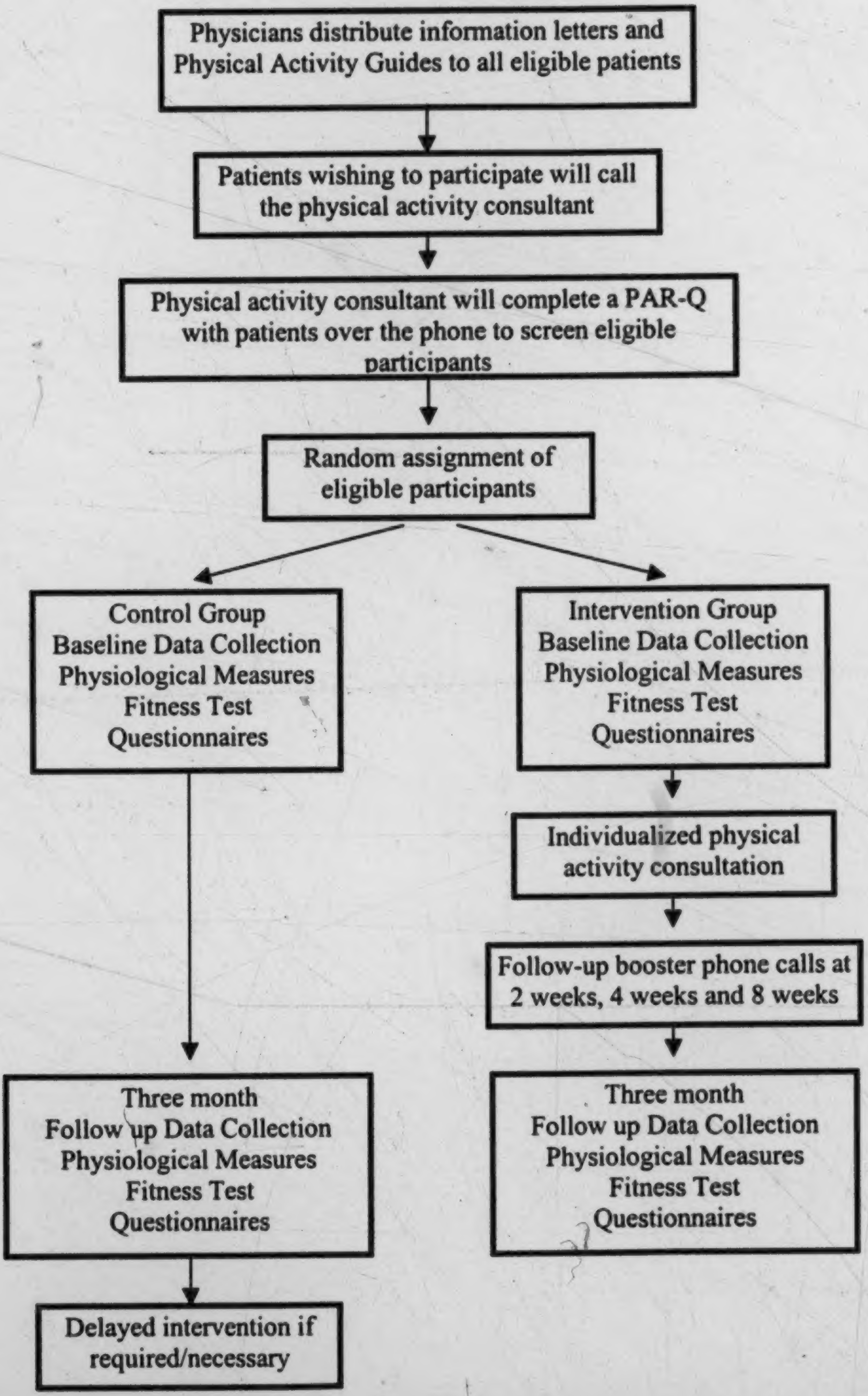
Palys, T. (1992). Research Decisions. Quantitative and Qualitative Perspectives. Toronto, Canada: Harcourt Brace Inc.

Rejeski,W., and Hobson, M. (1994). A framework for enhancing exercise motivation in rehabilitative medicine. In H. A. Quinney, L., Gauvin, and A. Wall (Eds.). Toward active living: Proceedings of the international conference on physical activity, fitness and health. Champaign, Il: Human Kinetics.

Smith, M., and Glass, G. (1987). Research and Evaluation in Education and the Social Sciences. Boston, MA: Allyn and Bacon.

APPENDIX A

RESEARCH DESIGN


Physicians distribute information letters and Physical Activity Guides to all eligible patients
Patients wishing to participate will call the physical activity consultant
Physical activity consultant will complete a PAR-Q with patients over the phone to screen eligible participants
Random assignment of eligible participants
Control Group Baseline Data Collection Physiological Measures Fitness Test Questionnaires
Intervention Group Baseline Data Collection Physiological Measures Fitness Test Questionnaires
Individualized physical activity consultation
Follow-up booster phone calls at 2 weeks, 4 weeks and 8 weeks
Three month Follow up Data Collection Physiological Measures Fitness Test Questionnaires
Three month Follow up Data Collection Physiological Measures Fitness Test Questionnaires
Delayed intervention if required/necessary

APPENDIX B

Physician Advice Cue Chart

Address the agenda

- Attend to patient's agenda.
- Express desire to talk about risk factors: "I'd like to talk to you about your level of physical activity."
- Define problem: "You are ____ " (e.g., not physically active); "This means ____ ."

Assess

- Assess patient's current level of physical activity.
- Assess and clarify patient's knowledge, beliefs, and concerns" "What do you know about the benefits of physical activity?"
- Assess and clarify patient's feelings about risk and change in behaviour: "How do you feel about becoming more physically active?"

Advise

- Provide physiologic feedback when available: "Your test results indicate that ______ is affecting your health."
- Tell patient that you strongly advise change.

Assist

- Provide support, understanding, praise, and reinforcement: "I recommend that you call Joanne to participate in her study."
- Provide patient with an envelope containing the information letter and a copy of the Physical Activity Guide.

(adapted from Pinto, et al., 1998)

APPENDIX C

UNIVERSITY OF ALBERTA

PARTICIPANT INFORMATION LETTER

MOVING ACTIVELY INTO PRIMARY CARE PREVENTION
The Promotion of Physical Activity in Medical Clinics

Joanne Gesell
Principal Investigator:
E-401 Van Vliet Centre
University of Alberta
Edmonton, AB
T6G 2H9
(780) 492-7424

Dr. Wendy Rodgers
Research Supervisor:
Faculty of Physical Education and Recreation
University of Alberta
Edmonton, AB
T6G 2H9
(780) 492-2677

Dear Participant:

Background:

Exercise is an important part of staying healthy. The purpose of this study is to encourage people to become more physically active. Your doctor believes in the health benefits of physical activity and is willing to participate in this study. We are asking you to call the researcher if you are interested in participating in this study. She will answer any questions you may have at that time.

Procedures:

The study includes an assessment of your physical fitness. We will also evaluate your thoughts and feelings about exercise and your health-related quality of life. A number of short questionnaires will assess quality of life and your feelings about exercise.

Health Canada recommends that we accumulate up to 60 minutes of mild physical activity on most days of the week. Our study is to encourage you to achieve this recommendation. We wish to study if people can increase their daily physical activity. The time you spend in physical activity will be up to you. You might decide to spend 60 minutes per day in physical activity, or you might spend 30 minutes, 3 days per week. You will be able to decide as you go along. Participants who agree to participate in the study will be randomly assigned to one of two groups. Each group will be advised to become more physically active, but the method of delivery will be different for each group. If one method proves to be more advantageous, the other group will be offered the same information at the end of the study.

APPENDIX C

UNIVERSITY OF ALBERTA

In terms of the actual time spent with the researcher, you will have a fitness test and questionnaire evaluation at the beginning of the exercise program. There will be a second fitness test and another set of questionnaires at the end of the program three months later. Participants will spend about 60 minutes at each of the first and second fitness testing sessions.

Your heart rate, blood pressure, height and weight will be measured before the fitness test. The fitness test involves walking on a treadmill for 12 minutes. Muscle soreness is a possible side effect of fitness testing, but this will go away in one or two days. These tests will be performed in the sport physiology lab at the University of Alberta, under the direction of Dr. Gordon Bell. Qualified fitness assessors (PFLC) will monitor participants throughout the test. The test will be stopped and appropriate steps taken should you feel uncomfortable at any time.

You are free to refuse to participate or to not answer any of the questions. You are free to withdraw from the study at any time. This study will not affect your ongoing treatment with your family physician in any way.

Possible Risks:

There are few possible risks expected as a result of participating in this study. You may feel some muscle soreness following the fitness test. You may also have some muscle soreness upon beginning the exercise program. This will pass as your fitness improves throughout the program. You will need to get your doctor's approval to participate in this study. There is a chance that some people might feel some emotional upset in answering the questionnaires. If this occurs, we would be happy to refer you to a qualified psychologist for counseling. Simply notify the researcher or your physician of your wish.

Possible Benefits:

There are two possible sets of benefits of the study. First, we believe that participants will become more physically fit. Second, what we learn from this study will be used to develop exercise programs and referral systems for other groups of people.

Confidentiality:

All data collected during the study will be kept in a locked filing cabinet in a lab at the university. The principal researcher will be the only person that has access to the reports. Personal information will be removed and replaced with numbers as it is

APPENDIX C

collected. No person will be identifiable in any reports of this project. All reports will only refer to the group of individuals responding. Data will be stored for seven years post publication and then destroyed. Your family doctor will only receive reports in summary form, where no individuals are identified. The only time your doctor would have access to personal information would be if some possible health risk were identified. We would ask your permission before we passed on any information to your family doctor.

If you have any questions about this study, please contact the Principal Investigator, or her Research Supervisor. These names are listed at the top of this letter. You may also contact Dr. Debra Shogan, (Associate Dean of Graduate Studies and Research) if you have concerns about this research study (492-5910). The information collected in this study will be used only for research and teaching purposes. If any further analysis is conducted with the study, further ethics approval will be sought first.

Thank you for taking the time to consider this study.

Sincerely,

Joanne Gesell
jgesell@ualberta.ca

APPENDIX D

Inclusion Criteria

- community-dwelling men and women 40-70 years of age
- receiving primary care from a participating study physician
- exhibiting a sedentary lifestyle
- willing and able to participate in all aspects of the study
- in stable health
- independent in activities of daily living
- able to alter physical activity in accordance with the intervention
- if on medication for chronic disease, on a stable dose for the last 3 months
- willing and able to give informed consent

Exclusion Criteria

- history or evidence of coronary heart disease:
    - ≥ 1 mm ST segment depression at < 6 METs or with symptoms of chest pain or discomfort at any level with exercise
- cerebral vascular disease
- peripheral vascular disease
- arrhythmia:
    - atrial fibrillation
    - complex ventricular arrhythmia
    - third-degree heart block
- valvular heart disease
- cancer (other than skin) in the last five years
- pulmonary disease
- severe psychiatric illness
- severe systemic disease
- blood pressure: resting diastolic > 100 mm Hg or resting systolic > 180 mm Hg
- pregnancy, lactation, or not practicing contraception (women only)

(Adapted from Blair et al., 1998 Activity Counseling Trial)

APPENDIX E

Physician Agreement to Participate

To the best of my knowledge, ____________________________, is physically capable of participating in the current physical activity study. He/She does not currently exhibit any exclusionary criteria preventing him/her from completing the sub-maximal fitness test, or from becoming more physically active on a regular basis.

____________________________	____________________________
(date)	(signature)

APPENDIX F

Physical Activity Readiness
Questionnaire - PAR-Q
(revised 1994)

PAR - Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO		
☐	☐	1.	Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
☐	☐	2.	Do you feel pain in your chest when you do physical activity?
☐	☐	3.	In the past month, have you had chest pain when you were not doing physical activity?
☐	☐	4.	Do you lose your balance because of dizziness or do you ever lose consciousness?
☐	☐	5.	Do you have a bone or joint problem that could be made worse by a change in your physical activity?
☐	☐	6.	Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
☐	☐	7.	Do you know of any other reason why you should not do physical activity?

If you answered

YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active — begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal — this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever — wait until you feel better; or
- if you are or may be pregnant — talk to your doctor before you start becoming more active.

Please note: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

You are encouraged to copy the PAR-Q but only if you use the entire form

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction.

NAME ____________________

SIGNATURE ____________________ DATE ____________________

SIGNATURE OF PARENT ____________________ WITNESS ____________________
or GUARDIAN (for participants under the age of majority)

continued on other side...

© *Canadian Society for Exercise Physiology*
Société canadienne de physiologie de l'exercice

Supported by: Health Canada Santé Canada

APPENDIX G

Tool #5 **ACTIVITY INVENTORY**

Have done	Currently doing	Would like to do	
☐	☐	☐	aerobics/exercise-to-music
☐	☐	☐	archery
☐	☐	☐	badminton
☐	☐	☐	baseball/softball
☐	☐	☐	basketball
☐	☐	☐	bicycling (utility or pleasure)
☐	☐	☐	bowling
☐	☐	☐	broomball
☐	☐	☐	calisthenics
☐	☐	☐	camping
☐	☐	☐	canoeing/kayaking
☐	☐	☐	climbing
☐	☐	☐	coaching
☐	☐	☐	curling
☐	☐	☐	dancing
☐	☐	☐	fencing
☐	☐	☐	floor hockey
☐	☐	☐	football
☐	☐	☐	gardening, yard work
☐	☐	☐	golf
☐	☐	☐	handball
☐	☐	☐	hiking
☐	☐	☐	hockey
☐	☐	☐	horseback riding
☐	☐	☐	household chores
☐	☐	☐	ice skating
☐	☐	☐	inline skating
☐	☐	☐	martial arts
☐	☐	☐	orienteering
☐	☐	☐	racquetball
☐	☐	☐	ringette
☐	☐	☐	roller skating
☐	☐	☐	rowing
☐	☐	☐	running/jogging
☐	☐	☐	sailing
☐	☐	☐	skateboarding
☐	☐	☐	skiing (X-country)
☐	☐	☐	skiing (downhill)
☐	☐	☐	snowshoeing
☐	☐	☐	soccer
☐	☐	☐	squash
☐	☐	☐	stair climbing
☐	☐	☐	swimming
☐	☐	☐	t'ai chi
☐	☐	☐	table tennis
☐	☐	☐	tennis
☐	☐	☐	volleyball
☐	☐	☐	walking
☐	☐	☐	weight training
☐	☐	☐	wind surfing
☐	☐	☐	yoga
☐	☐	☐	______________
☐	☐	☐	______________
☐	☐	☐	______________

APPENDIX G

Tool #6 INVENTORY OF LIFESTYLE NEEDS AND ACTIVITY PREFERENCES

I feel it is important to me to …

- ☐ like the people I'm with
- ☐ be in a group
- ☐ be independent
- ☐ get to know other people well
- ☐ meet many new people
- ☐ be a leader
- ☐ feel confident
- ☐ learn something
- ☐ be in pleasant, attractive surroundings
- ☐ be alone
- ☐ have a structured activity
- ☐ be able to do things at the last minute
- ☐ follow rules
- ☐ be praised
- ☐ have fun and enjoy myself
- ☐ release frustration
- ☐ take a risk
- ☐ enjoy the outdoors
- ☐ release energy
- ☐ improve my health
- ☐ have common interests with other people
- ☐ be able to contribute something to a group
- ☐ have other people like me
- ☐ be physically active
- ☐ use my imagination
- ☐ create something
- ☐ find the activity challenging
- ☐ feel safe and secure
- ☐ try something new and different
- ☐ be myself
- ☐ use my talents
- ☐ improve myself and my skills
- ☐ accomplish something
- ☐ relax
- ☐ spend time with my family.

Once you have checked the lifestyle needs that are important to you, list the *three* most important and identify which activities would most probably satisfy these needs.

Lifestyle Needs	Activity Preferences
1.	
2.	
3.	

APPENDIX G

Tool #7 **CHOOSING ALTERNATIVES FOR ACTION**

Name:

Change desired (objective):

	LIST ADVANTAGES	LIST DISADVANTAGES
Alternative 1.	⇨ ⇨ ⇨ ⇨	⇨ ⇨ ⇨ ⇨
Alternative 2.	⇨ ⇨ ⇨ ⇨	⇨ ⇨ ⇨ ⇨
Alternative 3.	⇨ ⇨ ⇨ ⇨	⇨ ⇨ ⇨ ⇨
Alternative 4.	⇨ ⇨ ⇨ ⇨	⇨ ⇨ ⇨ ⇨

APPENDIX G

Tool #8 **DECISION BALANCE SHEET**

This balance sheet will help you think through the possible consequences of participating in a chosen physical activity. By considering the potential gains and losses, you will be able to make an informed decision.

- Write down all the gains and losses you anticipate from your physical activity.
- Rate how important each one is for you – '1' would mean it has a small influence on your behaviour; '3' would mean it is a large influence. Add up the scores for each column and compare.
- Write down strategies that will help you maximize gains and minimize losses.

Gains to Self	*Losses to Self*	*Strategies* *(to maximize gains and minimize losses)*
Gains to Others	*Losses to Others*	*Strategies*

APPENDIX G

Tool #9 **MOTIVATION LIST**

If you are having trouble getting interested in physical activity, try to imagine the good things about being more active. Find two good things on the list below that would motivate you to be more active.

It makes me feel better. ☐
I look better. ☐
I have more energy. ☐
I will feel better about myself. ☐
I will sleep better. ☐
It will help me manage my weight. ☐
It will make me healthier. ☐
I will have fun. ☐
It helps me manage stress. ☐
I can work without tiring easily. ☐
It gives me more self-confidence. ☐
I feel strong. ☐
Others ______________________________
____
____
____
____

APPENDIX G

Tool #10 **FIRST-STEP PLANNER**

1. Think of two benefits you hope to get from being more active.

Write the benefits below:

2. Think of the easiest change you can make to increase your activity.

Take a look at the examples. Choose one that appeals to you or add your own. Think about activities you might enjoy. Try something new?!

Go for a walk after dinner. ☐
Do some gardening. ☐
Try a 2-minute "stretch break" at work. ☐
Others:

3. Try to be more active for just one day.

What day?
What activity?

4. Rate your activity by circling the number.

	Not at all	A little	A lot
Did you enjoy it?	1	2	3
Is it convenient?	1	2	3
Have you got time to fit it in?	1	2	3

Total Score =

Add up your score. If it is six or more, you have made a good choice. If it is less than six points, you may want to choose a different activity.

APPENDIX G

Tool #11 **SELF-CONTRACT**

1. My physical activity goal is:

2. What I would need to change to achieve it is:

3. What I am willing to do to make it happen is:

4. Others will know about the change I am making when:

5. I might sabotage my plan by:

6. Therefore, my contract to myself is:

7. Check-up dates: ______

Client Signature

Appraiser Signature

APPENDIX G

Tool #12 **GOAL-SETTING WORKSHEET**

When setting goals, play it SMART. Goals should be Specific, Measurable, Attainable, Realistic, and have a Time frame for completion.

Goals and Action Steps **Time Frame**

Goal #1 ______________________________ __________

Action Steps

1. ______________________________ __________
2. ______________________________ __________
3. ______________________________ __________

Goal #2 ______________________________ __________

Action Steps

1. ______________________________ __________
2. ______________________________ __________
3. ______________________________ __________

Goal #3 ______________________________ __________

Action Steps

1. ______________________________ __________
2. ______________________________ __________
3. ______________________________ __________

Success Indicators

1. ____
2. ____
3. ____
4. ____
5. ____

Date for next appraisal ________________________________

APPENDIX G

Tool #13 RELAPSE PLANNER

How confident are you that you'll keep up your physical activity during the next three months?

Not confident at all ☐ 1
Not very confident ☐ 2
Somewhat confident ☐ 3
Confident ☐ 4
Very confident ☐ 5

If your score was less than 4, complete the following exercise:

Many people have periods of inactivity. Sometimes these breaks can last for just a few days and sometimes a few years. Planning ahead for the 'tough' times may help you stay active.

1. Have you ever had trouble keeping your physical activity going before? If so, write down the reasons why.

2. If you have had trouble, what has helped you get back on track? (e.g., support from friends, joining a class, setting goals)

3. What situations do you think would make it tough to keep up your physical activity routine? How will you handle these situations to increase your chances of being successful?

High-Risk Situations	Solution(s)
e.g., people at work asking me to go for drinks after work (my usual workout time)	*1) tell everyone my regular workout schedule so they will consider it when they are choosing a time, 2) join them later, 3) schedule a make up time every week to cope with any unplanned changes*

4. What will help you get started again if you do have a 'break'? Write down your ideas.

Start-up Strategies

APPENDIX G

Tool #14 **DAILY ACTIVITY LOG**

	Type of Planned Activity training type* activity e.g., running, cycling, jogging, skiing, canoeing, hiking, swimming, aerobics, step aerobics. (Score 1 point for each)		Score 1 point for each 15 minutes in training activity.		Score for intensity High = 3 Medium = 2 Low = 1		Other daily activities e.g., bowling, walking to work, gardening. Score 1 point for each activity.		Score 1 point for every 15 minutes in other daily activities.		Daily totals: Desirable = 8 points Acceptable = 5 points Requires improvement = 4 or less
DAY	Activity	(points)	Time	(points)	Intensity	(points)	Activity	(points)	Time	(points)	Accumulated daily points
Monday (AM)											
Monday (PM)											
Tuesday (AM)											
Tuesday (PM)											
Wednesday (AM)											
Wednesday (PM)											
Thursday (AM)											
Thursday (PM)											
Friday (AM)											
Friday (PM)											
Saturday (AM)											
Saturday (PM)											
Sunday (AM)											
Sunday (PM)											
Total weekly activity points											

MOVING ACTIVELY
INTO
PRIMARY CARE PREVENTION

The Promotion of Physical Activity in Medical Clinics

APPENDIX H

Godin Leisure Time Exercise Questionnaire

The following questions ask you to recall your **present** level of physical exercise over the **past few weeks**. Considering a typical week (7 days), how many times on the average did you do the following kinds of exercise for more than 20 minutes during your free time over the past few weeks?

	Times per Week
Strenuous exercise (heart beats rapidly, sweating) (running, jogging, hockey, soccer, squash, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes, heavy weight training)	☐
Moderate exercise (not exhausting, light perspiration) (fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, dancing)	☐
Mild exercise (minimal effort, no perspiration) (easy walking, yoga, archery, fishing, bowling, horseshoes, golf, snowmobling)	☐

Now, for the *next* **few weeks,** how many times do you intend to do the following kinds of exercise for more than 20 minutes during your free time?

	Times per Week
Strenuous exercise (heart beats rapidly, sweating) (running, jogging, hockey, soccer, squash, etc.)	☐
Moderate exercise (not exhausting, light perspiration) (fast walking, baseball, tennis, easy bicycling, etc.)	☐
Mild exercise (minimal effort, no perspiration) (easy walking, yoga, archery, fishing, bowling, etc.)	☐

APPENDIX I

Theory of Planned Behavior

Please indicate to what extent you believe that each of the listed referents thinks you should participate regularly (3 to 5 times per week) in moderate physical activity for at least 30 minutes during your free time during the next three months. Please circle one number on each row.

	unlikely						likely
significant other/partner/spouse	-3	-2	-1	0	1	2	3
adult child	-3	-2	-1	0	1	2	3
friend	-3	-2	-1	0	1	2	3
family physician	-3	-2	-1	0	1	2	3

Are you inclined to comply with the opinion of each of the listed referents concerning your regular participation (3 to 5 times per week) in moderate physical activity for at least 30 minutes during your free time during the next three months? Please circle one number on each row.

	unlikely						likely
significant other/partner/spouse	-3	-2	-1	0	1	2	3
adult child	-3	-2	-1	0	1	2	3
friend	-3	-2	-1	0	1	2	3
family physician	-3	-2	-1	0	1	2	3

APPENDIX I

Listed below are obstacles other people have indicated get in the way of exercise. Which barriers affect/do not affect you; which have you been successful or unsuccessful in overcoming?

	Does this affect you?			How confident are you that you can overcome this barrier?									
				Not at all confident									Completely confident
	Frequently	Sometimes	Never	1	2	3	4	5	6	7	8	9	10
Too tired													
Work too much													
Bad day at work													
Feel ill													
Don't feel like it													
Family commitments													
Have no time													
Too lazy/lack energy													
Health conditions													
Have bad back													
Lack self-discipline													

APPENDIX I

Please **circle one number on each row** that best describes how you feel about exercise.

"In your opinion, to participate regularly (3 to 5 times per week) in at least 30 minutes of moderate physical activity during your free time within the next three months would be . . . ."

1 extremely worthless	2 quite worthless	3 slightly worthless	4	5 slightly worthwhile	6 quite worthwhile	7 extremely worthwhile
1 extremely bad	2 quite bad	3 slightly bad	4	5 slightly good	6 quite good	7 extremely good
1 extremely foolish	2 quite foolish	3 slightly foolish	4	5 slightly wise	6 quite wise	7 extremely wise
1 extremely useless	2 quite useless	3 slightly useless	4	5 slightly useful	6 quite useful	7 extremely useful
1 extremely harmful	2 quite harmful	3 slightly harmful	4	5 slightly beneficial	6 quite beneficial	7 extremely beneficial
1 extremely dull	2 quite dull	3 slightly dull	4	5 slightly interesting	6 quite interesting	7 extremely interesting
1 extremely unpleasant	2 quite unpleasant	3 slightly unpleasant	4	5 slightly pleasant	6 quite pleasant	7 extremely pleasant
1 extremely exhausting	2 quite exhausting	3 slightly exhausting	4	5 slightly invigorating	6 quite invigorating	7 extremely invigorating
1 extremely boring	2 quite boring	3 slightly boring	4	5 slightly fun	6 quite fun	7 extremely fun

APPENDIX I

One of the purposes of this study is to examine people's thoughts about exercise and the nature of their exercise involvement. There are no right or wrong answers. Please respond as honestly as possible.

0% - 10 - 20 - 30 - 40 - 50 - 60 - 70 - 80 - 90 - 100% Not Confident Completely Confident		Confidence Level
How confident are you that you could:	pace yourself to avoid over-exertion?	
	perform all the required movements?	
	follow directions from an instructor?	
	check how hard your activity is making you work?	

How confident are you that you could:	exercise 3 times per week for the next 3 months?	
	overcome obstacles that prevent you from participating regularly?	
	make up times you missed?	
	exercise regularly, no matter what?	

If I wanted to, I could easily accumulate 30 minutes of physical activity daily.	1 2 3 4 5 6 7 8 9 Extremely unlikely Extremely likely
How much control do you have over whether you accumulate 30 minutes of physical activity daily.	1 2 3 4 5 6 7 8 9 Very little control Complete control
For me to accumulate 30 minutes of physical activity daily is…	1 2 3 4 5 6 7 8 9 Difficult Easy

APPENDIX J

MOS 36-Item Short-Form Health Survey

Instructions: This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Answer every question by marking the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

(circle one)

Excellent	1
Very good	2
Good	3
Fair	4
Poor	5

2. Compared to one year ago, how would you rate your health in general now?

(circle one)

Much better now than one year ago	1
Somewhat better now than one year ago	2
About the same as one year ago	3
Somewhat worse now than one year ago	4
Much worse now than one year ago	5

APPENDIX J

3. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

(circle one number on each line)

ACTIVITIES	Yes, Limited A Lot	Yes, Limited A Little	No, Not Limited At All
a. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
b. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
c. Lifting or carrying groceries	1	2	3
d. Climbing **several** flights of stairs	1	2	3
e. Climbing **one** flight of stairs	1	2	3
f. Bending, kneeling, or stooping	1	2	3
g. Walking more than a kilometre	1	2	3
h. Walking **several blocks**	1	2	3
i. Walking **one block**	1	2	3
j. Bathing or dressing yourself	1	2	3

APPENDIX J

4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

(circle one number on each line)

	YES	NO
a. Cut down on the **amount of time** you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Were limited in the kind of work or other activities	1	2
d. Had **difficulty** performing the work or other activities (for example, it took extra effort)	1	2

5. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

(circle one number on each line)

	YES	NO
a. Cut down the amount of time you spent on work or other activities	1	2
b. Accomplished less than you would like	1	2
c. Didn't do work or other activities as carefully as usual	1	2

APPENDIX J

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

	(circle one)
Not at all	1
Slightly	2
Moderately	3
Quite a bit	4
Extremely	5

7. How much bodily pain have you had during the past 4 weeks?

	(circle one)
None	1
Very mild	2
Mild	3
Moderate	4
Severe	5
Very severe	6

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

	(circle one)
Not at all	1
A little bit	2
Moderately	3
Quite a bit	4
Extremely	5

APPENDIX J

9. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks –

(circle one number on each line)

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
a. Did you feel full of pep?	1	2	3	4	5	6
b. Have you been a very nervous person?	1	2	3	4	5	6
c. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
d. Have you felt calm and peaceful?	1	2	3	4	5	6
e. Did you have a lot of energy?	1	2	3	4	5	6
f. Have you felt downhearted and blue?	1	2	3	4	5	6
g. Did you feel worn out?	1	2	3	4	5	6
h. Have you been a happy person?	1	2	3	4	5	6
i. Did you feel tired?	1	2	3	4	5	6

APPENDIX J

10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

(circle one)

All the time	1
Most of the time	2
Some of the time	3
A little of the time	4
None of the time	5

11. How TRUE or FALSE is each of the following statements for you?

(circle one number on each line)

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
a. I seem to get sick a little easier than other people	1	2	3	4	5
b. I am as healthy as anybody I know	1	2	3	4	5
c. I expect my health to get worse	1	2	3	4	5
d. My health is excellent	1	2	3	4	5

APPENDIX K

Social Provisions Scale

Please indicate the extent to which you agree that each statement describes your current relationships with others using the following scale.

If you feel a statement is true of your current relationship with people, you would respond "strongly agree" and circle the number "4". If you feel a statement clearly does not describe your relationship, you would respond "strongly disagree" and circle the number "1".

---

1. There are people I can depend on to help me be more physically active if I really need it.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

2. I feel that I do not have close personal relationships with other people who are physically active.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

3. There is no one I can turn to for guidance with respect to becoming more physically active.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

4. There are people who depend on me to increase their physical activity.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

5. There are people who enjoy the same physical activities as I do.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

6. Other people who exercise do not view me as physically competent.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

APPENDIX K

7. I feel personally responsible for the well-being of a person whom I exercise with.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

8. I feel part of a group of people who share my attitudes and beliefs about physical activity.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

9. I do not think that the people respect my efforts to increase my physical activity.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

10. If something went wrong with my physical activity program, there is no one to come my assistance.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

11. I have close relationships with people who are physically active and who provide me with a sense of emotional security and well-being.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

12. There is someone I could talk to about my decision to become more physically active.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

13. When I am physically active my competence and skills are recognized.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

APPENDIX K

14. There is no one I know who shares my interests and concerns about physical activity.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

15. There is no one I exercise with who really relies on me for his/her physical well-being.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

16. There is a trustworthy person I could turn to for advice about physical activity if I were having problems.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

17. I feel a strong emotional bond with at least one other person who is physically active.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

18. There is no one I can depend on for assistance with my activity program if I really need it.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

19. There is no one important to me I feel comfortable talking about problems with my physical activity program.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

20. There are people important to me who admire my physical talents and abilities.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

APPENDIX K

21. I feel a lack of intimacy with other people who exercise.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

22. There is no one who exercises who likes to do the things I do.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

23. There are other exercisers I can count on in an emergency.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

24. No other exercisers need me to care for them.

strongly disagree	disagree	agree	strongly agree
1	2	3	4

APPENDIX L

CONSENT FORM

MOVING ACTIVELY INTO PRIMARY CARE PREVENTION

Do you understand that you have been asked to participate in a research study?	Yes	No
Have you read and received a copy of the attached information sheet?	Yes	No
Do you understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you had an opportunity to ask questions about the study?	Yes	No
Do you understand that you are free to refuse to participate in the study?	Yes	No
Has the issue of confidentiality been explained to you?	Yes	No
Do you understand who will have access to your records?	Yes	No
Do you want the investigator to inform your family doctor that you are participating in this research study? If so, please provide your doctor's name. ____________________ (Optional)	Yes	No

This study was explained to me by: ____________________

________________	________________	________________
Signature	Date	Witness (optional)
________________		________________
Printed Name		Printed Name (optional)

I believe that the information letter accurately reflects what is involved in the study.

________________	________________	________________
Investigator	Date	Supervisor

APPENDIX M

Theory of Planned Behavior

Researchers	Participants	Design	Dependent Variables	Theory Components	Findings
Ajzen & Driver, 1993	111 college students (aged 17-40 years)	prospective	leisure activities	ATT SN PBC (direct) PBC (indirect)	• ATT, SN, and PBC predicted intention, and intention and PBC predicted behavior
Ajzen & Driver, 1994	150 undergraduate students	retrospective	leisure activities willingness to pay	ATT	• perceived affect associated with the activity predicted WTP
Ajzen & Madden, 1988	124 Females 45 Males undergraduate students	prospective	attendance of class lectures	ATT SN PBC (direct) PBC (indirect)	• ATT and SN significantly predicted intention ($R^2 = .59$) • adding PBC increased $R^2 = .68$
Ajzen & Madden, 1988	56 Females 34 Males undergraduate students	prospective	receiving an "A"	ATT SN PBC (direct) PBC (indirect)	• ATT significantly predicted intention ($R^2 = .48$) • adding PBC increased $R^2 = .65$
Armitage & Conner, 1999	334 Females 79 Males hospital workers (aged 20-64 years)	prospective	low-fat diet	ATT SN SE PBC	• ATT and SN accounted for similar amounts of variance in intention at each time point ($R^2 = .45$ and .54) • PBC and SE were significant predictors of intention ($R^2 = .15$ at time 1 and $R^2 = .09$ at time 2)

ATT: attitude; SN: subjective normative beliefs; PBC: perceived behavioral control (indirect); SE: self-efficacy (direct)
Note: Perceived behavioral control was measured both directly and indirectly in some studies.

APPENDIX M

Theory of Planned Behavior

Researchers	Participants	Design	Dependent Variables	Theory Components	Findings
Brenes, Strube & Storandt, 1998	93 Females 12 Males older adults (aged 53-84)	prospective	exercise	ATT SN SE PBC	• ATT, SN and SE explained 9% of behavior at 1 month, only SE made a significant independent contribution • PBC explained 27% of variance in behavior at 1 month and 10% at 3 months
Courneya & McAuley, 1994	89 Females 81 Males undergraduate students (mean age 20.34)	prospective	physical activity *frequency *intensity *duration	ATT SE	• SE contributed unique variance to intensity, frequency and duration intention • ATT contributed unique variance to intensity and duration intention
Godin, Valois & Lepage, 1993	*217 Females 130 Males adults *152 pregnant women (aged 18-40 years)	prospective	exercise	ATT SN PBC (direct) PBC (indirect)	• PBC influenced behavior only through intention (t = 8.10) for adults • ATT and PBC influenced behavior only through intention (t = 2.26 and t = 3.74) for pregnant women • SN was not predictive in either study

ATT: attitude; SN: subjective normative beliefs; PBC: perceived behavioral control (indirect); SE: self-efficacy (direct)
Note: Perceived behavioral control was measured both directly and indirectly in some studies.

APPENDIX M

Theory of Planned Behavior

Researchers	Participants	Design	Dependent Variables	Theory Components	Findings
Kerner & Grossman, 1998	23 Females 50 Males professionals (aged 20-67 years)	prospective	exercise frequency of exercise	ATT SN PBC	• ATT and SN accounted for 26.6% of the variance in intention to exercise • PBC accounted for significant variance in frequency of exercise, but not exercise intention
Kimiecik, 1992	156 Females 176 Males corporate employees (aged 18-67)	prospective	vigorous physical activity	ATT SN PBC (direct)	• PBC accounted for significant variance in intention ($R^2 = .66$) and behavior ($R^2 = .49$) • ATT accounted for significant variance in intention to exercise ($R^2 = .59$)
Madden, Ellen & Ajzen, 1992	166 undergraduate students	retrospective	sleep, shop, exercise, video, album, friend, vitamins, wash car, laundry, caffeine	ATT SN PBC (direct) PBC (indirect)	• PBC predicted intention between subjects ($R^2 = .01$ to $.20$) • PBC predicted intention within-subjects ($R^2 = .48$ to $.59$) • PBC predicted behavior within-subjects ($R^2 = .28$ to $.38$)
Michels & Kugler, 1998	military beneficiaries (aged 65-70 years)	retrospective	exercise	ATT SN PBC	• those getting regular exercise stated that doctor recommended exercise • ATT, SN, PBC are strongly associated with intent to exercise

ATT: attitude; SN: subjective normative beliefs; PBC: perceived behavioral control (indirect); SE: self-efficacy (direct)
Note: Perceived behavioral control was measured both directly and indirectly in some studies.

APPENDIX M

Theory of Planned Behavior

Researchers	Participants	Design	Dependent Variables	Theory Components	Findings
Millstein, 1996	765 primary care physicians	prospective	physician delivery of preventive services	ATT SN PBC (direct)	• ATT and SN significantly predicted intention ($R^2 = .15$) • adding PBC increased $R^2 = .27$ • ATT and SN significantly predicted behavior ($R^2 = .11$) • adding PBC increased $R^2 = .22$
Nguyen, Otis & Potvin, 1996	1839 Males (aged 30-60 years)	prospective	low-fat diet	ATT SN PBC (direct) PBC (indirect)	• model explained 51% of the total variance in intention • SN had a significant influence on intention
Norman & Conner, 1996	749 patients 427 attenders 322-non-attenders (aged 31-42 years)	prospective	health-check attendance	ATT SN PBC (direct)	• model explained 50% of the total variance in intention to attend, with all three components of the theory emerging as significant independent predictors • the model explained only 3% of the total variance in actual attendance behavior

ATT: attitude; SN: subjective normative beliefs; PBC: perceived behavioral control (indirect); SE: self-efficacy (direct)
Note: Perceived behavioral control was measured both directly and indirectly in some studies.

APPENDIX M

Theory of Planned Behavior

Researchers	Participants	Design	Dependent Variables	Theory Components	Findings
Parker, Manstead & Stradling, 1995	598 drivers (aged 17-56+ years)	retrospective	driving violations	ATT SN PBC (direct)	• ATT, SN, and PBC accounted for between 34% and 37% of the variance in intention • PBC contributed additional variance in intention from 3% to 8%
Terry & O'Leary, 1995	135 undergraduate students (mean age 20.16)	prospective	exercise	ATT SN SE PBC	• SE influenced intention, but not behavior • PBC had no effect on intention, but emerged as a significant predictor of behavior
van Ryn, Lytle & Kirscht, 1996	185 telephone company employees (aged 26-61 years)	prospective	*breast self-examination *exercise	ATT SN SE	• SE, SN and ATT all have independent significant direct effects on intention to perform breast self-examinations • ATT and intention were significantly correlated with exercise behavior
Verplanken, Aarts, Knippenberg & Moonen, 1998	200 adults (aged 20-70 years)	prospective	travel mode choices	ATT SN PBC (direct)	• PBC correlated weakly, but significantly with intention • PBC correlated significantly with behavior

ATT: attitude; SN: subjective normative beliefs; PBC: perceived behavioral control (indirect); SE: self-efficacy (direct)
Note: Perceived behavioral control was measured both directly and indirectly in some studies.

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Reid & Morgan, 1979	**Providers**: 1 MD, 1 health educator **Patients**: • under fit firefighters • 24-56 years • 100% male • n=134 (t1) • n=124 (t2)	• Medical screening clinic at fire stations • U.S.	Exercise target specified for each subject	**Theory**: HBM **Providers**: none reported **Patients**: physician advice, test interpretation, plus 1 hour informational session with health educator, plus self-monitoring for 8 weeks	Compliance ≥ 2 X/wk, 15-min self-report and 9.5% increase in estimated VO_2max from bicycle ergometer	• % compliance @ 3 months: intervention = 55% control = 29% (p = .01) • % compliance @ 6 months: intervention = 32% control = 26% (NS) • % Δ VO_2max @ 3 months: intervention = 8.9 control = 2.5 (p = .01) • % Δ VO_2max @ 6 months: intervention = 12.4 control = 9.7 (NS)

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Logsdon et al., 1989	**Providers**: Primary care MDs; • 46 I • 26 C **Patients**: • outpatients • 18-75+ years • 55% male • n=2218 (t1) • n=1774 (t2)	• 5 multispecialty group practices; 14-21 primary care MDs /site • 3 U.S. regions	Regular exercise	**Theory**: none stated **Providers**: CME; written materials; encounter forms for 9 age groups; reimbursed **Patients**: visits ≥ 15 min, MD counseling, written materials	Self-reported regular exercise = "vigorous physical exercise 3/week"; (duration and time range not reported); 12 months	• % exercising @ 12 months: intervention = 32% control = 24% ($p < .10$)

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Lewis & Lynch, 1993	**Providers**: 24 FP residents **Patients**: • outpatients • 23% male • n=383 • 162 reported receiving advice vs. 221 no advice	• Ambulatory practice of academic Family Medicine Department • U. S.	Moderate-intensity physical activity	**Theory**: none stated; based on interviews with physicians **Providers**: 15-min training; protocol card; patient material in chart to cue counseling **Patients**: 2-3 min MD exercise advice and educational handout	Self-report of frequency and duration of 2 major activities in past month; % exercising	• PA duration 1 month Δ: advice = +27 no advice = -5 ($p < .01$) • PA min/week 1 month Δ: advice = +109 no advice = -24 ($p < .01$) • % exercise 1 month: advice = 10 no advice = 2 ($p < .04$)

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Graham-Clarke & Oldenburg, 1994 "Fresh Start"	**Providers**: 80 GPs **Patients**: • Patients with > one CVD risk factor • 18-69 years • mean age 52 • 51% male • n=758 • 4 month FU n=334 • 12 month FU n=382	• 75 general practice offices • Australia	Leisure physical activity	**Theory**: TTM and cognitive behavioural **Providers**: trained in workshop; written and video materials **Intervention 1**: risk assessment and video **Intervention 2**: risk assessment, video, self-help booklets **Control**: risk assessment, feedback	Self-report of frequency and duration of vigorous and moderate PA and walking past 2 weeks; used also to estimate energy expenditure (4 categories); 4 and 12 months	• Type, frequency, duration of PA: energy expenditure @ 4 and 12 months: • NS difference between groups (values not reported)

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Calfas et al., 1996 "PACE"	**Providers**: 16 MDs and 1 NP **Patients**: • sedentary patients • mean age 39 • 16% male • n=255 (t1) • n=212 (t2)	• 17multispeciality offices, majority small group practices • U. S.	Moderate intensity physical activity	**Theory**: SCT and TTM **Providers**: Individual 30-60 min training on protocol and behaviour change skills; office staff training **Patients**: assessment and 2-5 counseling by provider, 5-10 min call with health educator 2 weeks post visit	Weekly minutes spent walking for exercise, total walking, and Caltrac motion sensor; 4-6 weeks	• Exercise walking min/week 4-6 week: intervention = +39 control = +10 (p < .05) • Total walk 4-6 weeks Δ: intervention = +34 control = +10 (p < .03) • Caltrac counts (sub-sample): intervention = +23 control = -6 (p < .01)

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Marcus et al., 1997 "PASE"	**Providers**: 4 primary care MDs on clinical faculty at medical school **Patients**: • sedentary patients ≥ 50 • mean age 67 • 28% male • n=63 • 6 week FU n=44	• One office practice • U. S.	Moderate intensity physical activity	**Theory**: TTM and SCT **Providers**: 2 hour training of MDs and office staff; MD received written prompts, education materials, $45 for each FU visit **Patients**: 3-5 min MD structured counseling @ office visit plus one month FU visit	Physical activity scale for the elderly (PASE) over phone: frequency, duration, type of leisure time PA over past 7 days, plus household activity; 6 weeks	• PASE score 6 week Δ: intervention = +6 control = +0.4 (NS)

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Swinburn, et al., 1998 "Green Prescriptions"	**Providers**: 37 GPs **Patients:** • sedentary patients • mean age 49 • 39% male • n=491 • 6 week FU n=456	• Primary care urban practices • New Zealand	Moderate intensity physical activity, primarily walking	**Theory**: none stated **Providers:** 1 training session to assess and prescribe PA **Patients**: goal oriented verbal advice and written Rx during 5 min MD counseling Control: goal oriented verbal advice	Self-reported time in PA (walking, sports, other) past 2 weeks; collected by GPs at baseline and by phone at 6 weeks	• % participation in any PA @ 6 weeks: intervention = 86% control = 77% (p < .01) • % increasing PA @ 6 weeks: intervention = 73% control = 63% (p < .01)

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Bull & Jamrozik, 1998	**Providers**: GPs, no. not given **Patients**: • sedentary patients with appointments • 18-60+ years • 34% male • n=763 • 1 month n=534 • 6 month n=458 • 12 month n=443	• 10 general practice clinics • Australia	Moderate intensity physical activity	**Theory**: TTM **Providers**: fact sheet on benefits/barriers to PA **Patients**: 2-3 minutes GP counseling to increase moderate activity; written material mailed after visit	Percent "active" defined as reporting ≥ 1 episode of PA in previous two weeks; 1, 6, and 12 months	• % active 1 month: intervention = 40% control = 31% (p = .01) • % active 6 months: intervention = 38% control = 30% (p = .02) • % active 12 months: intervention = 36% control = 31% (NS)

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Stevens et al., 1998	**Providers**: Allied health professionals, no. not given **Patients**: • sedentary or low active • 45-74 years • mean age 59 • 42% male n=714 • 8 month n=415	• Participants recruited through physician offices and referred to community leisure center • U. K.	Moderate or vigorous intensity physical activity	**Theory**: none stated **Providers**: not stated **Patients**: 2 consultations with exercise development officer and 10-week exercise program at community leisure center **Control**: mailed material	Self-report physical activity (specific measure not reported)	• % increased PA over 8 months: intervention = +11.2 control = +0.8 ($p < .02$) • Change in mean no. bouts of PA/week: intervention = 5.95 control = 4.43 ($p < .01$)

APPENDIX N

Primary Prevention Studies of Physical Activity Counseling in Health Care Settings

Study	Sample	Intervention Setting	Physical Activity Target	Intervention	Dependent Variable	Results
Goldstein et al., 1999 "PAL"	**Providers**: 34 primary care physicians **Patients**: • sedentary patients • mean age 65.6 • 35% male • n=355 • 6 week n = 335 • 8 month n = 312	• 24 urban family practices • U. S.	Moderate intensity physical activity	**Theory**: TTM and SLT **Providers**: 1 hour training of MDs, MD received written prompts, and pt education materials, $40 for each FU visit **Patients**: 5 min MD structured counseling, plus one month FU, additional mailings in months 2-5	Stage of Motivational Readiness; Physical activity scale for the elderly (PASE) over phone; 6 weeks and 8 months	• Δ in motivational readiness at 6 weeks: intervention = 89% control = 74% (p < .01) • at 8 months: intervention = 79% control = 88% (NS) • Δ in PASE scores at 6 weeks: intervention = 11.03 control = 13.49 (NS) • at 8 months: intervention = 4.05 control = 2.21 (NS)

APPENDIX O

Analysis of Variance Between Treatment Conditions at Baseline

Variable	Intervention Condition Mean (SD)	Control Condition Mean (SD)	df	F	Sig.	Observed Power
Attitude	6.06 (0.74)	6.17 (0.59)	1, 55	1.03	.45	.58
Subjective Norm	6.36 (1.22)	6.69 (0.46)	1, 55	.69	.75	.33
Perceived Behavioral Control	19.64 (5.45)	21.07 (4.75)	1, 55	.61	.86	.32
Barrier Efficacy	7.31 (2.06)	7.60 (1.36)	1, 55	1.83	.08	.84
Task Efficacy	78.44 (17.45)	79.71 (15.40)	1, 55	.98	.51	.56
Scheduling Efficacy	74.69 (25.77)	78.34 (13.60)	1, 55	1.68	.09	.85
Physical Activity Intention (METs)	36.93 (23.75)	36.48 (19.56)	1, 55	.58	.92	.29
Current Physical Activity (METs)	14.04 (15.83)	21.66 (20.23)	1, 55	1.47	.15	.79
Physical Functioning	80.89 (19.96)	78.45 (23.34)	1, 55	.73	.73	.36
Role Limitation Physical	67.86 (41.31)	75.86 (28.73)	1, 55	2.59	.05	.69
Bodily Pain	68.36 (22.68)	72.66 (20.00)	1, 55	1.36	.22	.63
General Health	61.39 (20.28)	70.24 (17.92)	1, 55	1.42	.18	.73
Vitality	48.93 (20.06)	51.90 (20.46)	1, 55	.80	.65	.39
Social Functioning	73.21 (22.49)	79.31 (19.84)	1, 55	1.13	.36	.40
Role Limitation Emotional	63.10 (41.91)	67.82 (41.29)	1, 55	2.13	.11	.51
Mental Health	70.14 (17.47)	75.31 (14.31)	1, 55	.97	.50	.51

Guidance	12.00 (2.04)	12.16 (2.06)	1, 55	.68	.74	.30
Reassurance of Worth	10.96 (1.88)	11.55 (2.01)	1, 55	1.18	.33	.48
Social Integration	11.29 (1.86)	12.10 (2.53)	1, 55	1.86	.08	.75
Attachment	10.75 (2.53)	11.10 (2.92)	1, 55	1.02	.44	.46
Nurturance	9.25 (2.22)	9.19 (2.53)	1, 55	.60	.82	.28
Reliable Alliance	11.64 (2.20)	11.52 (2.05)	1, 55	.47	.89	.20
Systolic Blood Pressure (mm Hg)	126.30 (12.27)	127.55 (12.48)	1, 55	1.48	.15	.79
Diastolic Blood Pressure (mm Hg)	86.57 (10.35)	84.41 (8.13)	1, 55	.91	.57	.50
Pre-Exercise HR (BPM; 0 minutes)	81.00 (9.18)	76.93 (10.74)	1, 55	.88	.63	.48
Exercise HR 1 (BPM; 2 minutes)	101.64 (13.25)	100.29 (14.11)	1, 54	1.02	.50	.52
Exercise HR 2 (BPM; 4 minutes)	115.46 (14.27)	111.57 (14.66)	1, 54	.83	.69	.44
Exercise HR 3 (BPM; 6 minutes)	125.21 (15.13)	120.86 (14.65)	1, 54	.82	.70	.37
Exercise HR 4 (BPM; 8 minutes)	136.14 (16.18)	131.59 (17.27)	1, 53	.97	.54	.47
Exercise HR 5 (BPM; 10 minutes)	148.39 (15.61)	141.76 (17.14)	1, 51	1.21	.36	.53
Exercise HR 6 (BPM; 12 minutes)	156.50 (16.37)	153.08 (19.39)	1, 46	.81	.70	.37